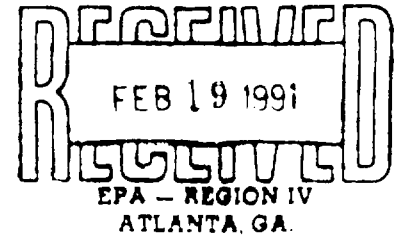


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FINAL

REMEDIAL INVESTIGATION REPORT
PHASE I & PHASE II

MEDLEY FARM SITE
GAFFNEY, SOUTH CAROLINA

FEBRUARY 1991

VOLUME I

SIRRIE JOB NO. G-8026

SIRRIE ENVIRONMENTAL CONSULTANTS
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AA	Atomic Absorption
ASTM	American Society For Testing and Materials
BEHP	Bis(2-Ethylhexyl) Phthalate
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DWHA	EPA Drinking Water Health Advisories
EM	Electromagnetic
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GC/EC	Gas Chromatography/Mass Spectrometry
GC/MC	Gas Chromatography/Electron Capture
HRS	Hazard Ranking System
ICP	Inductively Coupled Plasma
ID	Inside Diameter
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goals
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSL	Mean Sea Level
NGVD	National Geodetic Vertical Datum
NPL	National Priority List
NSF	National Sanitation Foundation
NUS	NUS Corporation
OCDD	Octochlorodibenzo-p-dioxin
OD	Outside Diameter
OVA	Organic Vapor Analyzer
PCB	Polychlorinated biphenyl
PCE	Perchloroethylene (Tetrachloroethylene)
POP	Project Operations Plan
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation
RPD	Relative Percent Difference
SQL	Sample Quantitation Limit
SARA	Superfund Amendments and Reauthorization Act of 1986
SCDHEC	South Carolina Department of Health and Environmental Control
SCWRC	South Carolina Water Resource Commission
SVOCS	Semi-Volatile Organic Compounds
SWA	Safe Drinking Water Act
TAL	Target Analyte List

LIST OF ACRONYMS
(Continued)

TCE	Trichloroethylene
TCL	Target Compound List
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds

1.0 EXECUTIVE SUMMARY

The Medley Farm site (the Site) consists of approximately seven acres of the Ralph Medley farm property located in a rural section of Cherokee County, approximately six miles south of Gaffney, South Carolina. Available information indicates that disposal of drummed and other waste materials occurred at the site from approximately 1973 to June, 1976. During late spring and early summer of 1983, waste materials were removed from the site by a contractor directed by EPA, pursuant to Section 104 of CERCLA. A total of 5,383, 55-gallon drums and 15-gallon containers were removed from the site. Approximately 2,132 cubic yards of solid waste and contaminated soils and 70,000 gallons of water were also removed. The contaminated water was drained from six small lagoons which were backfilled with clean earth and/or graded to the surrounding topography after scraping contaminated sludges from the shallow depressions. Analytical testing of solid and liquid waste materials sampled during the EPA removal operation indicated that the primary chemical constituents consisted of volatile organic compounds. These included toluene, benzene, methylene chloride, tetrachloroethylene (PCE) and vinyl chloride.

The South Carolina Department of Health and Environmental Control (SCDHEC) and the United States Environmental Protection Agency (EPA) conducted preliminary studies of the Site from 1983 to 1984. The Medley Farm site was proposed for addition to the National Priorities List (NPL) in June, 1986. The Site was placed on the NPL in March, 1990. In January, 1988, an Administrative Consent Order was signed by five potentially responsible parties (the Steering Committee) identified by EPA to carry out and fund the Remedial Investigation (RI) and Feasibility Study (FS) of the Medley Farm site.

This report presents the results of all Remedial Investigation studies of the Site. The results of the RI are being used to evaluate risks associated with the site and to conduct the Feasibility Study in which options for site remediation are evaluated.

The results of the FS will be presented in a separate Feasibility Study Report. The baseline Risk Assessment (RA) will be included in the FS document.

The development of a Work Plan for the Medley Farm site RI/FS was initiated in March, 1988. The RI/FS Work Plan was approved by Region IV of the United States Environmental Protection Agency in late August, 1988. A Project Operations Plan (POP) which described procedures to be followed during implementation of the RI/FS was subsequently developed (Sirrione, January 1989) and approved by EPA.

Initial RI studies were performed during the period of October 1988 to January 1990 (Phase I). A draft report presenting the results of the Phase I RI was submitted to EPA Region IV in March, 1990. The Agency's comments on the draft report were provided to the Steering Committee on May 15, 1990. Based upon evaluation of the results of the Phase I RI, and consideration of Agency comments, additional RI studies (Phase II) were required to provide sufficient data to complete the evaluation of risks associated with the Site and to support the selection of the most cost effective permanent remedy for the site. This is consistent with the provision for a Phase II RI in the approved POP for this site.

Phase II RI activities were described in detail in the Phase II RI/FS Work Plan submitted to EPA on July 11, 1990. Phase II RI studies were performed during August through November, 1990, following EPA (the lead agency) approval and direction to proceed. Although EPA forwarded a copy of the Phase II Work Plan to SCDHEC, SCDHEC did not respond until after EPA directed that the work proceed. SCDHEC's comments were generally consistent with EPA's. To the extent that additional concerns were raised by SCDHEC, changes were made and implemented with the approval of EPA to address those concerns.

The overall objectives of the Medley Farm Site Remedial Investigation were to:

- Characterize the nature and extent of contaminants present at the Medley Farm site, if any; and
- Characterize the site hydrogeology and geology.

The Scope of Studies included in the Remedial Investigation were selected to characterize these factors to the extent required to evaluate potential risks, if any, to human health and the environment (Risk Assessment - RA), and to evaluate alternatives for site remediation, if required (Feasibility Study).

Phase I of this Remedial Investigation included:

- Review of all existing data and a soil gas survey to identify locations for source characterization sampling and analyses;
- The excavation of 16 test pits for source characterization sampling and to evaluate the potential presence/extent of residual waste materials;
- Ten soil borings drilled and sampled to depths of 25 feet to evaluate the vertical extent of residual chemicals, if any, present in soils;
- Fracture trace analysis to determine appropriate monitoring well installation locations;
- The installation of seven monitoring wells and ground water sampling/analysis to evaluate the potential presence of contaminants in ground water;
- Hydraulic testing to evaluate aquifer characteristics at the site;

- Surface water and stream sediment sampling at four locations along Jones Creek to evaluate potential impacts to these media in the closest perennial creek to the site;
- Stream gauging and measurement of water levels to determine the interrelationships between ground water and surface water in the vicinity of the site.

Phase I of the RI was performed in two subphases (Phase IA and IB) to allow for the development of a list of indicator parameter chemicals which were used for analyses performed on samples collected during subsequent investigations. Indicator parameters were selected to be representative of the most toxic, mobile and persistent chemicals at the site, as well as those present in the larger amounts. Indicator parameter chemicals were approved by EPA prior to Phase IB sampling.

Chemical analyses performed during the Phase IA of the Remedial Investigation included complete TCL (Target Compound List - organic compounds) and TAL (Target Analyte List - inorganic compounds) analyses of ground-water samples from four on site monitoring wells and eight soil samples collected from test pits at suspected lagoon sites. TCL/TAL analyses include volatile organic compounds (VOC), semi-volatile organic compounds (SVOCs), pesticides, PCBs and inorganic compounds.

Based upon evaluation of the results of the Phase IA analyses, the following list of site specific indicator parameters was approved by EPA for subsequent sampling efforts:

<u>Sample Matrix</u>	<u>Analytical Fraction</u>
Ground Water:	TCL Volatile Organics
Surface Water:	TCL Volatile Organics TCL Semi-Volatile Organics
Soils:	TCL Volatile Organics TCL Semi-Volatile Organics
Stream Sediments	TCL Volatile Organics TCL Semi-Volatile Organics

Chemical analyses performed during Phase IB of the RI included analyses of; seven ground water samples for VOCs; four stream sediment and four surface water samples for VOCs and SVOCs; 30 soil samples from soil boring for VOCs and SVOCs; and six soil samples from test pits for VOCs and SVOCs. In addition to these indicator parameter analyses, three background soil samples were analyzed for inorganic compounds and pesticides and ground water samples from each of the two background wells were analyzed for inorganic compounds in addition to VOCs and SVOCs. Although there is no evidence that dioxins were stored or disposed of at the site, one composite soil sample was subjected to dioxin analyses during Phase IB as required by EPA.

All chemical analyses performed during this phase of the RI were performed by an EPA-certified CLP (Contract Laboratory Program) laboratory according to strict CLP protocols.

In order to respond to USEPA and SCDHEC comments on the Phase I RI to provide sufficient data to complete the evaluation of potential risks associated with the site and to support the development and comparison of potential remedial alternatives, performance of the Phase II RI was proposed by the Steering Committee, and approved by the Agency. Analyses performed during Phase II were based upon the list of indicator parameters developed at the completion of Phase IA. PCB analyses were added to the list of analyses

performed on near surface soil samples collected during this phase, in response to concerns expressed by SCDHEC in their comments on the Phase II RI/FS Work Plan. Additional inorganic analyses were also performed on near surface soil samples from seven locations and ground water samples collected from two background wells to confirm background concentrations of inorganic compounds in these media.

Phase II of the Medley Farm Site Remedial Investigation included:

- Collection of surface soil samples from thirteen locations in the former disposal area and around its perimeter. Twelve of these samples were subjected to complete TCL analyses (Volatile and Semi-volatile organics, Pesticides and PCBs). Four of these twelve were also analyzed for TAL inorganics (metals). The additional sample was added to replace the SVOC duplicate broken at the lab, that sample was analyzed in duplicate for SVOCs only;
- Collection of composite surface soil samples from three background areas. These samples were analyzed for TAL-inorganics (metals);
- Installation of fourteen additional monitoring wells;
- Installation of one additional standpipe piezometer for ground-water level measurements;
- Sampling and analyses of ground water from all nineteen water bearing monitoring wells installed during the RI (Ground water was not encountered in two deep monitoring wells completed in bedrock. These wells are designated as BW111 and BW112.);

- Discrete interval sampling of ground water in one deep bedrock well (BW105) to evaluate the vertical distribution of contaminants in ground water occurring in the fractured bedrock;
- Hydraulic testing (water pressure tests and slug tests) in the fourteen new monitoring wells installed during Phase II;
- Measurement of the total depth and ground water level of the nearby domestic water supply well (Sprouse) and survey of the Sprouse well location and elevation for reference to site specific data.

Chemical analyses performed during Phase II of the RI included quick turn around analyses of ground water samples collected from five initial Phase II monitoring well locations (SW101, SW102, SW104, SW106 and BW105). These samples were analyzed for TCL volatile organic compounds utilizing routine laboratory QA/QC. The results of these initial Phase II ground-water analyses were used to determine the final number and locations of monitoring wells installed during Phase II in accordance with the rationale presented in the Phase II RI/FS Work Plan.

To further delineate the vertical extent of contamination detected in ground-water samples collected from the fractured bedrock at BW105, two deep bedrock wells (BW111 and BW112) were added to the Scope of the Phase II RI in late September, 1990, after consultation with and approval from the EPA RPM. These wells were cased to approximately fifty feet below the bottom of BW105 and then advanced an additional 60 feet below the bottom of the casing. No significant fractures were encountered in these wells. This was confirmed by water pressure testing. Since no water bearing fractures were encountered at these locations, ground-water samples could not be obtained from these wells.

At the completion of Phase II, one complete round of ground-water samples was collected and analyzed from all water-bearing wells installed during the RI. This involved sampling nineteen monitoring wells installed at the Medley Farm site during Phase I and Phase II of the RI. All of these samples were subjected to TCL volatile organic analyses. In addition, filtered and unfiltered ground-water samples were collected from the two background wells (SW1 and BW1) for TAL inorganic analyses (metals). All samples collected during this sampling event were analyzed by an EPA-certified CLP (Contract Laboratory Program) laboratory following strict CLP protocols.

The following conclusions are drawn from the results of this Remedial Investigation:

- Contaminants are present at the site in soils in the immediate vicinity of the disposal area and in ground water in the saprolite and bedrock beneath and downgradient of the former disposal area.
- Contaminants present in soils are related to distinct, localized, primarily shallow source areas of direct disposal (lagoons or drum disposal areas).
- The small amount of residual source materials found consist of thin, isolated pockets of sludges and debris located at former lagoon sites. This material was typically encountered at depths of one-half to two feet below ground surface.
- Contaminants detected in soils consist of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) pesticides and PCBs. PCBs were only detected at low levels in test pit source characterization samples and surface soil samples. PCBs were not found above TSCA action levels. Pesticides were only detected at trace levels at three locations; two samples collected from test pits and one surface soil sample.

- Concentrations of inorganic constituents detected in soil samples collected from the site are consistent with concentrations detected in soil samples from local background locations and with common ranges reported for natural soils. No elevated levels of inorganic constituents were observed in source characterization analyses.
- The only contaminants detected in ground water at the site consist of VOCs. VOCs were detected in ground-water samples collected from saprolite and bedrock wells, with the highest concentrations occurring immediately beneath the source area.
- Water level measurements in the Sprouse domestic well, the background wells (SW1 and BW1), and the piezometer located NW of the source area indicate that the Sprouse well and the two background wells are hydraulically upgradient of the Medley Farm site and have therefore not been impacted by former disposal activities.
- No contaminants were detected in ground-water samples collected from the two background wells (saprolite and bedrock) located between the Site and the Sprouse well.
- Concentrations of inorganics detected in ground water are consistent with local background levels. Where MCLs were exceeded in downgradient monitoring wells, MCLs were also exceeded in the upgradient background wells, indicating naturally-occurring concentrations of inorganics above MCLs. Inorganics detected above MCLs in monitoring wells at the site are not related to former disposal activities at the Medley Farm Site.

- The ground-water yield from wells installed in the upper portion of the bedrock are significantly higher than from wells installed in the saprolite. The dominant direction of ground water flow is to the southeast. Vertical gradients at the site are generally upward and of varying magnitude.
- Contaminants detected in ground water have not reached the closest perennial discharge area (Jones Creek, located to the southeast and east of the site). No contaminants were detected in analyses of surface water and stream sediments collected from Jones Creek. VOCs were not detected in monitoring wells installed immediately west of Jones Creek.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE

The purpose of this Remedial Investigation (RI) Report is to describe the nature and extent of contaminants identified at the Medley Farm site and to describe methods used to collect and evaluate data. This information will be used as the data base to evaluate risks associated with the site and to conduct a Feasibility Study (FS) to evaluate options for site remediation, if required. This study was performed in accordance with applicable United States Environmental Protection Agency (EPA) guidance as listed in Section 8.0. A Risk Assessment for this site will be included in the forthcoming FS Report.

2.1.1 Remedial Investigation Approach and Objectives

The limited investigations of the Medley Farm site performed prior to this RI did not fully determine the extent of contaminants identified in soils and ground water. The overall objective of this RI was to obtain sufficient data for the evaluation of potential risks, if any, to human health and the environment, and to perform an FS assessing any necessary remedial alternatives.

The RI objectives presented in the initial Work Plan (Sirrione, August 1988) approved for performance of the Medley Farm Site RI/FS included:

- development of an accurate topographic site map;
- determination of the nature and extent of soil contamination attributable to former disposal activities at the site;
- determination of whether any drums or other containerized waste materials remain at the site;
- determination of the nature and extent of ground-water contamination;
- determination of potential mechanisms for off-site transport of contamination;

- identification of potential receptors and analysis of the potential impact of contamination, if any, to off-site receptors; and
- identification of potential areas for any necessary remedial action.

This Work Plan presented a multiphased approach to allow for the evaluation of data collected during initial characterization efforts and for the re-assessment of proposed sampling locations, analytical parameters, and investigation techniques.

The initial RI/FS Work Plan and subsequent Project Operations Plan (POP - Sirrine, January 1989) approved for this site presented detailed objectives for Phase IA and Phase IB Remedial Investigation activities designed to provide the anticipated level of site characterization adequate for the development of a Risk Assessment and Feasibility Study for the Site. These approved documents also provided for the performance of Phase II RI efforts, if required, to support the assessment of remedial alternatives and impacts of potential receptors (RI/FS Work Plan - Medley Farm Site, August 1988, p.18). As indicated in the approved documents, the need for Phase II efforts was evaluated after completion of Phase I and the initial RI draft. Based upon evaluation of the Phase I data and consideration of Agency comments on the Phase I draft RI submitted to EPA (March, 1990), Phase II Remedial Investigations were proposed. Proposed Phase II RI activities were described in detail in the Phase II RI/FS Work Plan for the Medley Farm Site prepared by Sirrine and submitted to the Agency on July 11, 1990. Phase II field efforts were initiated on August 8 following receipt of approval to proceed from the EPA Remedial Project Manager (RPM) and direction to proceed the week of August 6.

The Phase II Work Plan was revised (October, 1990) to include Agency comments and the Medley Farm Site Steering Committee responses relevant to the scope of Phase II RI activities.

The Phase I RI field investigations were conducted in two phases (IA and IB) to allow for evaluation of data collected during initial source characterization and for re-assessment of

proposed sampling locations and analytical parameters. The break between Phase IA and Phase IB was for the development of a site-specific list of indicator parameters based upon the results of the analyses of Target Compound List (TCL) and Target Analyte List (TAL) parameters during Phase IA. The indicator parameters, approved by EPA, formed the basis for analyses performed during Phase IB and Phase II of the RI. The objectives and major elements of each phase are outlined below.

Objectives of the Phase I (IA) Field Investigations were:

- Investigate the potential presence of residual sources of contamination at the site;
- Characterize any residual sources of contamination present at the site;
- Provide an initial assessment of the horizontal extent of residual sources and soil contamination present at the site;
- Develop a set of site-specific indicator parameters for use during subsequent sampling and analyses;
- Provide initial characterization of the geology and hydrogeology of the site to guide subsequent assessment efforts;
- Provide an initial assessment of the potential presence of ground-water contamination, if any, resulting from former activities at the site;
- Characterize the nature of any ground-water contamination present; and
- Characterize the ground-water flow regime at the site.

Objectives of the Phase I (IB) Field Investigation were:

- Additional characterization of the horizontal extent of any residual sources or soil contamination identified during the Phase IA field investigation to the extent required for the assessment of remedial alternatives;
- Investigate the vertical extent of residual sources and residual chemicals in soils;
- Investigate the extent of ground-water contamination; and

- Gather additional data sufficient to support the assessment and feasibility of remedial alternatives.

The Phase I RI provided initial overall characterization of hydrogeologic conditions at the Medley Farm Site and identification of contaminants associated with former disposal activities. Based upon evaluation of the data obtained from the Phase I (IA and IB) RI activities, it was necessary to perform the Phase II RI activities provided for in the POP. Phase II RI activities focused on gathering additional data required to evaluate the potential risks associated with the Site contaminants, the fate of Site contaminants in the environment, and potential receptors. This required further investigation of the hydraulic relationships between ground water present in the saprolite and bedrock and adjacent surface water features.

Objectives of the Phase II Field Investigation were to:

- Determine the concentrations of contaminants in surface soils to provide data required to complete risk assessment calculations with respect to dermal exposure and ingestion of soil;
- Refine the delineation of the former disposal areas to complete the Risk Assessment and support the analysis of alternative remedies in the Feasibility Study;
- Complete the evaluation of the hydraulics of the aquifer system beneath the Site to support the assessment of potential remedial options for ground water in the Feasibility Study;
- Provide additional characterization of the horizontal and vertical extent and concentrations of contaminants present in ground water occurring in the saprolite and bedrock beneath the Site;

- Confirm ground-water flow patterns for purposes of the Risk Assessment and to substantiate that the nearby domestic water supply well (the Sprouse well) has not been impacted by former disposal activities at the Site;
- Provide additional characterization of background levels of inorganic constituents in ground water and soils at the Site to confirm that inorganics are not associated with former Site disposal activities;
- Confirm ground-water discharge areas.

2.1.2 Summary of Remedial Investigation Sampling and Analyses

Phase I (IA) Field Investigations included:

- A passive soil gas survey to confirm the selection of appropriate locations for source characterization efforts;
- Excavation of 10 test pits for initial source characterization;
- Installation of seven monitoring wells for ground-water sampling and water level measurement;
- Ground-water sampling of four wells: SW3, SW4, BW2, and BW4;
- Hydraulic testing (water pressure tests) of three open hole bedrock wells (BW2, BW3 and BW4) and,
- TCL and TAL analyses of four ground-water samples and eight soil samples.

Phase I (IB) Field Investigations included:

- Ten soil borings for additional source characterization and evaluation of background soil characteristics;
- Six additional test pits;
- Surface water and stream sediment sampling;

- Ground-water sampling of all monitoring wells installed during Phase I (seven wells);
- Hydraulic testing (slug tests of all wells);
- Analyses of seven ground-water samples, 36 soil samples, four stream sediment and four surface water samples for the list of indicator parameters developed during Phase IA.

Phase II Field Investigations included:

- Collection of surface soil samples from thirteen locations in the former disposal area and around its perimeter. All of these samples were subjected to complete TCL analyses (Volatile and Semi-Volatile Organics, Pesticides and PCBs). Four of these samples were also analyzed for TAL inorganics (metals) for comparison with the analyses of background samples;
- Collection of surface soil samples from three background areas. These samples were analyzed for TAL inorganics (metals);
- Installation of fourteen additional monitoring wells;
- Installation of one additional standpipe piezometer for ground-water level measurements;
- Sampling and analyses of ground water from all nineteen water bearing monitoring wells installed during the RI (ground water was not encountered in two deep monitoring wells completed in bedrock);
- Discrete interval sampling of ground water in one deep bedrock well (BW105) to evaluate the vertical distribution of contaminants in ground water occurring in the fractured bedrock;
- Hydraulic testing (water pressure tests and slug tests) in the fourteen new monitoring wells installed during Phase II;
- Measurement of the total depth and ground water level of the nearby domestic water supply well (Sprouse) and survey of the Sprouse well location and elevation for reference to site specific data.

The number and type of field activities, sampling, and analysis performed during the Medley Farm Site RI is summarized on Table 2.1. All RI sampling locations are shown on Figure 2.1.

2.1.3 Sample Identification

The various types of samples and corresponding matrices of samples collected during the Medley Farm Site RI have been identified according to the following designations:

- HA - surface soil collected with hand auger
- SB - soil from test boring
- TP - soil/residual source material from test pit
- SW - ground water from monitoring well screened in saprolite
- BW - ground water from monitoring well screened in bedrock
- SS - stream sediment
- RW - surface water

Sample locations are identified with a number immediately following the letter designation. For example, SW1 indicates saprolite monitoring well number one. A number, preceded by a hyphen, is used to identify specific sampling events at all ground water, surface water/stream sediment and surface soil sampling locations. For example, SW3-2 identifies ground water samples collected during the second sampling event from saprolite well SW3. All monitoring wells installed during Phase II of the RI were assigned 100 series designations to distinguish them from wells installed during Phase I. For example, SW1 was installed during Phase I and SW101 was installed during Phase II. For soil boring and test pit samples which were collected at the same time from each location, the last digit is used to denote sampling interval. For example, the sample collected from the third depth interval in soil boring number two is identified as SB2-3.

Table 2.1
Summary of Phase I and Phase II
Field Activities, Sampling, and Analyses
Medley Farm Site Remedial Investigation

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<u>Activity/Installations</u>	<u>TCL/TAL²</u>	<u>Indicator Analyses³</u>	<u>Dioxin⁴</u>
PETREX® Soil Gas Survey (123 Collectors) ⁵	N/A ¹	N/A	N/A
Ten Saprolite Ground Water Monitoring Wells	2	17	0
Eleven Bedrock Ground Water Monitoring Wells	2	18	0
Two Permanent Ground-Water Piezometers	N/A	N/A	N/A
Sixteen Test Pits (Source Characterization)	8 ⁶	6	0
Sixteen Surface Sampling Locations (Hand Auger Borings)	7-TAL (metals) 12-TCL (organics)	0	0
Ten Soil Borings	0	30	1
Four Surface Water Samples	0	4	0
Four Stream Sediment Samples	0	4	0
Hydraulic Testing			
• Fourteen Slug Tests	N/A	N/A	N/A
• Ten Water Pressure Tests	N/A	N/A	N/A
Physical Soils Analyses			
• Twenty-Seven Moisture Content Analyses	N/A	N/A	N/A
• Thirty-Nine Sieve Analyses	N/A	N/A	N/A
• Four Hydrometer Analyses	N/A	N/A	N/A
• Seventeen Atterberg Limit Analyses	N/A	N/A	N/A
• Four Total Organic Carbon Content Analyses	N/A	N/A	N/A

Notes:

1. N/A indicates that analyses were not applicable for that given activity.
2. TCL/TAL Analyses include VOCs, SVOCs, Pesticides/PCBs, and Inorganics.
3. Indicator analyses consist of VOCs for ground water, VOCs and SVOCs for surface water, and VOCs and SVOCs for soils/sediments.
4. Although there is no history of dioxin disposal or storage at the Medley Farm site, shallow soil samples were taken from soil borings SB2 and SB5 and composited for dioxin analysis as required by EPA.
5. Each PETREX collector was analyzed by Mass Spectrometer to yield relative ion count data.
6. Limited analysis of samples collected from two of the sixteen test pits (TP6 and TP8) are discussed in Section 5.4.

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Figure 2.1

Overall Subsurface Exploration Locations

Quality assurance/quality control samples were designated as follows:

- A - duplicate sample
- B - field blank
- C - trip blank
- D - rinsate collected from soil drilling or sampling equipment
- E - rinsate collected from water sampling equipment
- DL - sample diluted by analytical lab for re-analysis

For example, BW2-1E denotes a rinsate sample collected from the bailer employed to collect sample BW2-1.

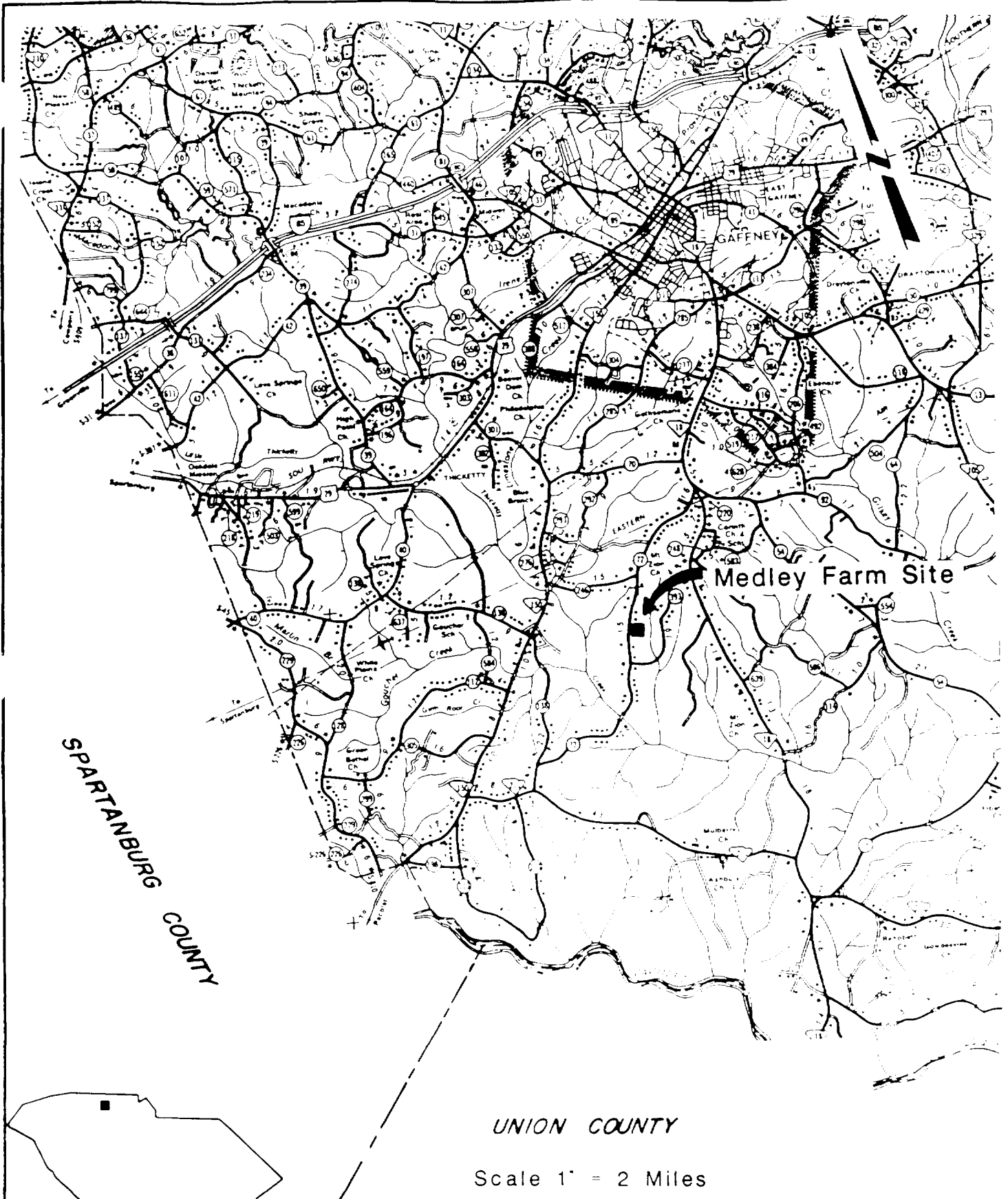
2.2 OVERVIEW

The Medley Farm property consists of 61.9 acres of rural land located approximately six miles south of Gaffney, South Carolina in Cherokee County on County Road 72 (Burnt Gin Road).

The Medley Farm Site consists of an approximately seven-acre section of the Ralph Medley Farm parcel that is situated on top of a small hill. The location of the site and the approximate property boundaries are shown on Figures 2.1, 2.2 and 2.3.

2.2.1 History

The Medley Farm is currently owned by Ralph C. Medley, who acquired the property from William Medley in 1948. Based upon available information, prior to the mid-1970s, the site was maintained as woods and pasture land. Available information indicates that disposal of drummed and other waste materials began at the site in 1973. Waste disposal at the Medley Farm site was reportedly terminated in June, 1976. At the time of the South Carolina Department of Health and Environmental Control (SCDHEC) inspection described

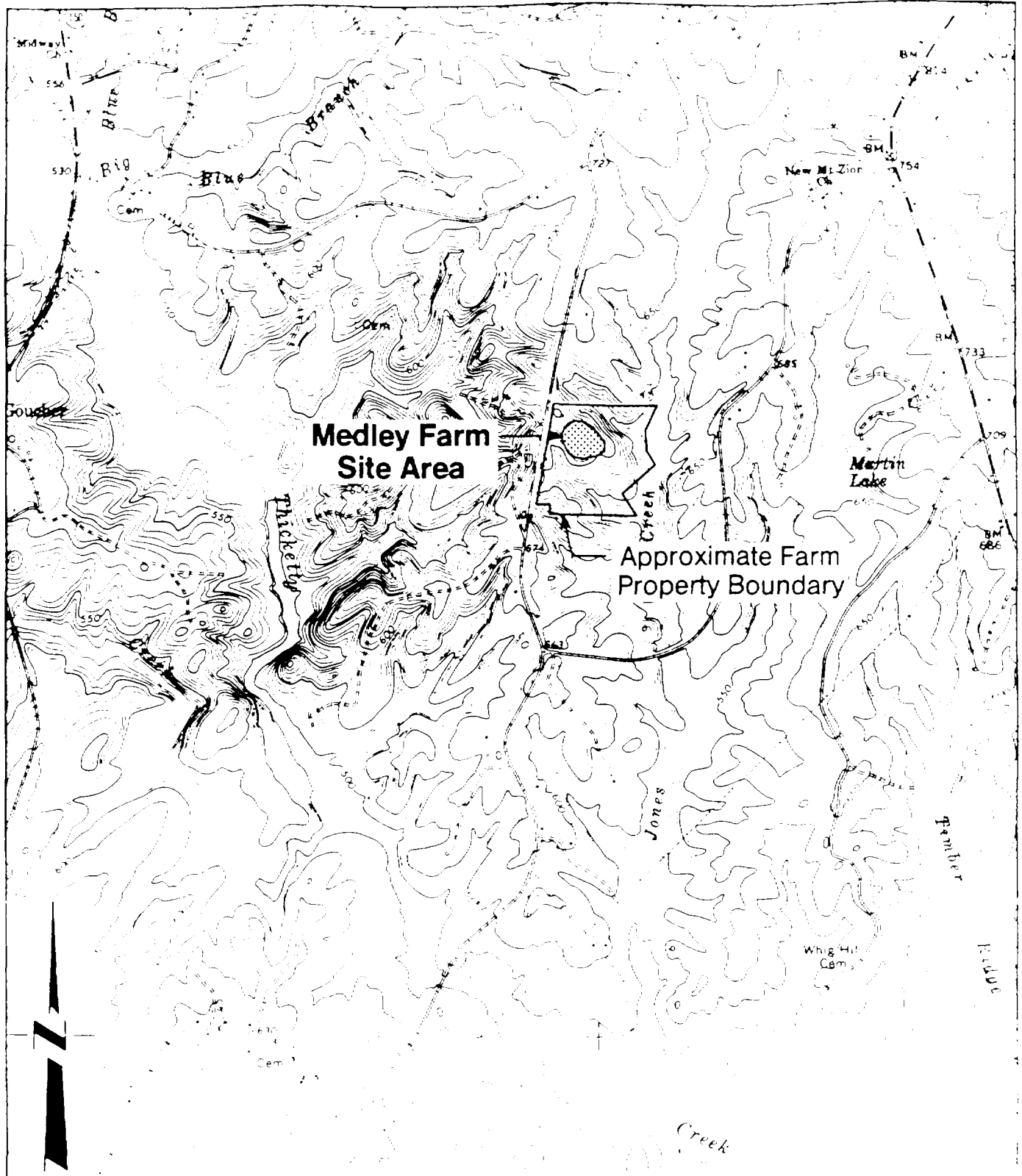


Map showing location of site and county in South Carolina.



Greenville, South Carolina

Figure 2.2
Medley Farm Site
Cherokee County
Gaffney, South Carolina



USGS Pacolet Mills Quadrangle

Scale 1:24,000

Figure 2.3
Approximate Boundaries of
Medley Farm Site and Farm Property

Medley Farm Site Gaffney, South Carolina

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in Section 2.2.3, drums were stored on-site in a random fashion. Drums were scattered in open pits or in one of six small lagoon areas. No formal records of disposed waste materials were maintained at the Medley Farm site.

2.2.2 Present Site Conditions

The Medley Farm site is remotely located in a rural portion of Cherokee County, South Carolina. The majority of the former disposal area is covered with weeds, briars, and small scrub trees.

The Medley Farm property is surrounded by dense woods, and vehicular access to the site can only be obtained by passing directly in front of the Medley's residence.

2.2.3 Previous Investigations and Remedial Activities

On May 3, 1983, members of the Compliance and Enforcement Section of the SCDHEC Bureau of Solid and Hazardous Waste Management visited the Medley Farm site and observed approximately 2,000, 55-gallon drums in various conditions. The drums were piled randomly over the area and a chemical odor was noted. A number of shallow excavations were observed which contained discolored standing water. It was noted that some drums were standing or lying in the water in these pits. A number of the drums were observed to be in a deteriorated condition. Areas of stressed vegetation were observed. In addition to the 55-gallon drums, there were numerous plastic containers of various sizes. Most of these containers were in a condition such that the markings were no longer legible. Contents of most drums could not be identified.

Based on this inspection, SCDHEC returned on May 19, 1983 to collect samples of soils for analysis. Results of analyses reported a number of volatile organic compounds (VOCs)

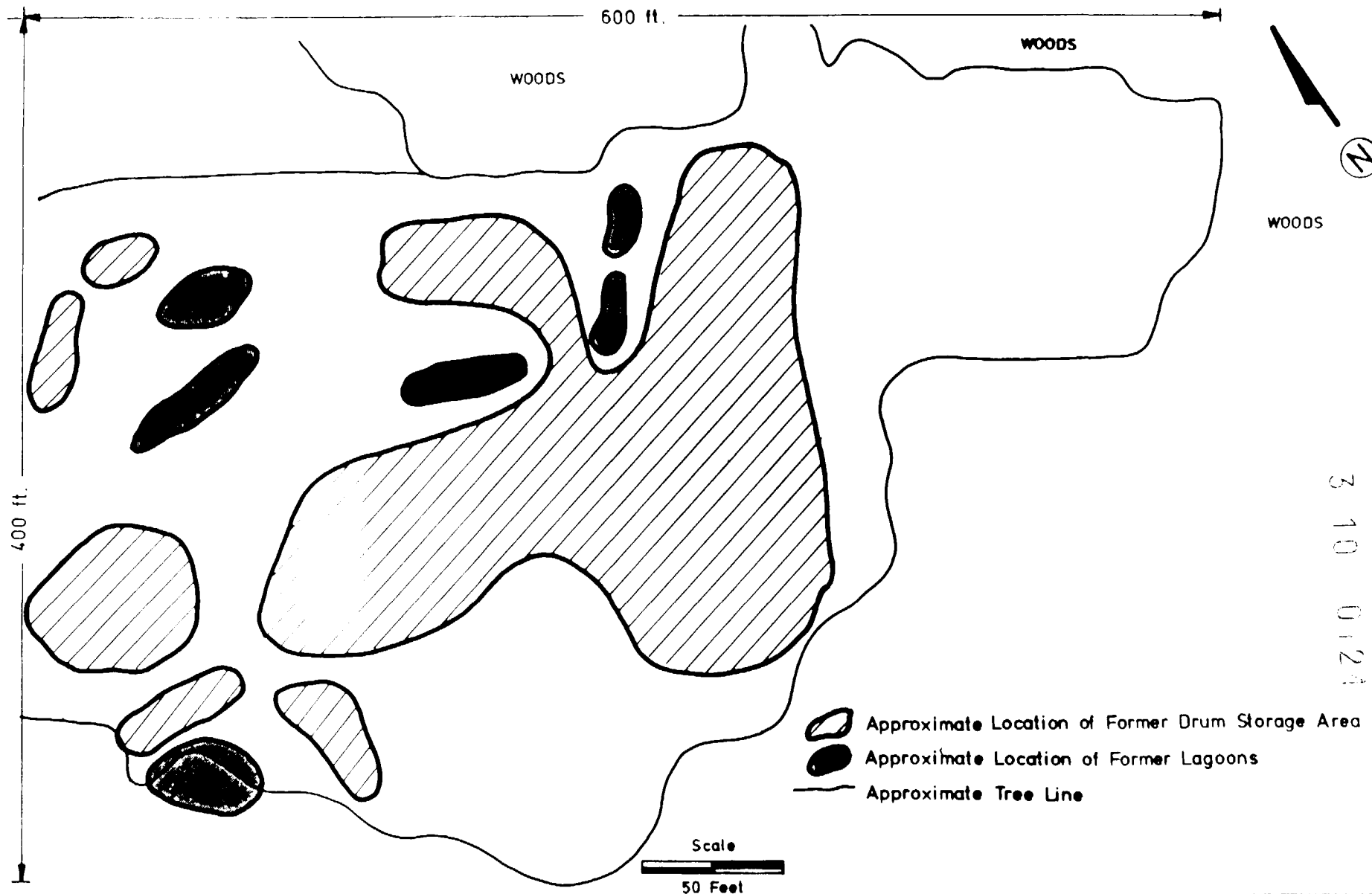
including methylene chloride, trichloroethylene (TCE), trans-1,2-dichloroethylene, and base neutral extractable compounds. No acid extractable compounds were detected among the analyses performed. Certificates of analysis for the May, 1983 SCDHEC investigation are presented in the Medley Farm RI/FS Work Plan dated August, 1988.

SCDHEC informed the EPA of the sampling results and EPA visited the site during the week of May 30, 1983. Additional samples were collected for analysis. Among the contaminants detected were: methylene chloride, vinyl chloride, perchlorethylene (PCE), phenol, toluene, TCE, and 1,2-dichloroethane. One composite soil sample contained polychlorinated biphenyls (PCBs) at low levels. Available certificates of analysis for the May, 1983 EPA investigation are presented in Appendix B of the Medley Farm RI/FS Work Plan dated August, 1988.

An immediate removal action was initiated on June 20, 1983 by U.S. EPA pursuant to Section 104 and other provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The work was performed by O.H. Materials Company on EPA's behalf. A total of 5,383 drums and 15-gallon containers were removed from the site. These included full, partially full, and empty containers. Compatibility testing of drum contents was done prior to bulking of liquid wastes. Empty drums were crushed and taken to a sanitary landfill. The bulked liquids (24,200 gallons) were taken off-site by tanker and incinerated. The solid waste and contaminated soils, totalling 2,132 cubic yards, were taken to an approved hazardous waste landfill. Three drums containing PCBs (Arochlor 1254, 1260, and 1248) were overpacked and sent to an approved disposal facility. An estimated 70,000 gallons of water were drained from the six small lagoons and treated in a pressurized sand/gravel/activated carbon filtration system for the removal of organics. The treated effluent was analyzed to ensure that it met state discharge standards prior to release into Jones Creek. The lagoons were reportedly backfilled with clean earth and graded to the natural topography. Remedial actions were completed on July 21, 1983.

Analytical testing of the drum contents, as well as the water and sediment in the lagoons during the removal action, indicated the presence of organic compounds. These included: toluene, benzene, methylene chloride, PCE, and vinyl chloride. Samples from adjacent homeowners' wells were collected by SCDHEC on June 23, 1983 and trace levels of methylene chloride were detected. The well with the highest reported concentration appeared to be upgradient of the Medley Farm site (the "Sprouse" well). The locations of domestic water supply wells sampled by SCDHEC during their investigations in 1983 and 1984 are shown on Figure 2.5.

NUS Corporation (NUS) conducted a geological and geophysical study of the Medley Farm site at the direction of EPA during the week of August 1, 1983. The study was designed to determine the potential for ground-water contamination at the site. To accomplish this, a literature search on the geology and hydrology of the area and a field study of the site were performed. The field study included electrical resistivity soundings, a magnetometer survey and an electromagnetic (EM) survey. The anomalous areas identified by NUS based upon their geophysical study results are illustrated on Figure 2.4. The NUS report concluded that the most likely source of observed anomalies was residual chemicals in the soil from previous disposal practices. Sirrine compared the geophysical study results to the aerial photographs of the Medley Farm disposal area provided to Sirrine by SCDHEC. The anomalous areas illustrated on Figure 2.4 generally correlate with the former barrel storage and lagoon areas visible on the aerial photographs. Because no identifiable features were included on the original NUS figures for reference, however, more detailed correlation of this data cannot be made. The magnitude of the anomalies indicated that buried drums were not likely except in a single small area. NUS did not estimate the potential depth of suspected soil contamination.



Source: NUS Report on Geophysical Study TDD No. F4-8307-03

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Figure 2.4
Medley Farm Site RI
Summary NUS Electromagnetic
Survey Results
Gaffney, South Carolina

Figure 2.5

Municipal Water Supply and Domestic Wells

The location of possible fracture zones were estimated by NUS from linear surface features called lineaments in the geological assessment. The NUS report concluded that such fracture systems may be conduits for ground water contamination. The report did not estimate the extent of contamination in these hydrologic systems. Results of the EM survey indicated that suspected subsurface contaminants may have migrated as much as several hundred feet to the southeast. This estimate was based only on the geophysical screening and was not verified with sampling and analysis.

The NUS report stated that the suspected contaminants were most likely confined to the soil layer above the relatively impermeable bedrock.

SCDHEC revisited the site in April, 1984 to perform a preliminary investigation and install a monitoring well. An attempt to construct well MD2 was ended when the borehole reached auger refusal at 54 feet without encountering saturated conditions. No precise documentation (surveyed) of the location of this boring could be found by Sirrine in SCDHEC or EPA files. This boring was apparently drilled near the top of the knob in the former disposal area. A second borehole (MD2A), which was drilled at a location at lower elevation, encountered saturated conditions at 65 feet and a monitoring well was successfully installed. The well was constructed of TriLoc machine-cut screen (0.10-inch slot) and 2-inch diameter schedule 40 PVC casing, and was installed after the augers were removed from the borehole. The borehole remained open during well placement. Due to the indication of a perched water-table condition at 65 feet, two screens were placed at 63 to 68 and 78 to 83 feet. The screened intervals were sand packed using No. 8-35 Silica Sand Pack. After gravity placement of the sand pack, water-level measurement indicated approximately 20 feet of water in the well (SCDHEC, 1984). The location of this well was surveyed by Sirrine during Phase I of the RI and is printed on all figures containing monitoring wells.

Soil from both boreholes and ground water from the well were analyzed for volatile organics, primary metals, and acid and base-neutral extractables. Volatile organic analyses of soil collected at 10 feet in borehole MD2 showed 81.4 ug/kg of methylene chloride and 102 ug/kg of 1,2-dichloroethane as the only quantifiable compounds. SCDHEC ground-water sampling results for the VOCs are presented in Table 2.2. Certificates of analysis for the April, 1984 SCDHEC investigation are documented in the approved Medley Farm RI/FS Work Plan.

Monitoring well MD2A was resampled by SCDHEC in July, 1984. Four private wells (Sprouse, Sarrett, Davis, Pittman) located off-site were also resampled. One other off-site private well (Solesbee) was sampled in December 1984. Results of the analyses of ground water samples collected from monitoring well MD2A and one private well (Sprouse property) are presented in Table 2.2. Analysis of ground-water samples from the other four private wells did not indicate the presence of contaminants. Trace levels of methylene chloride and 1,2-dichloroethane were the only contaminants detected in samples collected from the Sprouse well. QA/QC for these sampling efforts is not well documented. These concentrations may be laboratory artifacts or the result of cross contamination. It is important to note that ground-water level measurements were made during the RI on September 27, 1990 in the Sprouse water well, monitoring wells SW1 and BW1, and piezometer PZ101. These measurements and survey data confirm that the Sprouse well is located hydrogeologically upgradient of any former disposal activities at the Medley Farm site. A more detailed discussion of ground water flow directions at the site is included in section 4.2.2. This upgradient location indicates that contaminants identified in ground-water samples collected from the Sprouse well are not associated with the Medley Farm site. Chemical analyses of ground-water samples collected from background wells installed between the Medley Farm site and the Sprouse well during the RI confirmed this observation. No contaminants were detected in analyses performed on samples collected from the background wells.

Table 2.2

Medley Farm Site RI
SCDHEC Volatile Organic Ground-Water Analyses

SCDHEC MONITORING WELL ON THE MEDLEY FARM SITE:

<u>Well MD2A</u>	<u>Date of Collection</u>	
	<u>April 13, 1984 (1)</u>	<u>July 18, 1984 (2)</u>
1) methylene chloride	39.05 ug/L	9.22 ug/L
2) 1,1-dichloroethene	1,887.00 ug/L	1,645.00 ug/L
3) 1,1-dichloroethane	160.5 ug/L	43.7 ug/L
4) trans-1,2-dichloroethene	37.9 ug/L	28.0 ug/L
5) chloroform	8.0 ug/L	3.56 ug/L
6) 1,2-dichloroethane	22.05 ug/L	7.53 ug/L
7) 1,1,1-trichloroethane	3,362.00 ug/L	2,188.00 ug/L
8) carbon tetrachloride	3,804.00 ug/L	830.00 ug/L
9) trichloroethene	6.6 ug/L	3.14 ug/L
10) 1,1,2-trichloroethane	66.9 ug/L	15.3 ug/L
11) toluene	29.6 ug/L	*
12) perchloroethylene	2.5 ug/L	*

DOMESTIC WATER WELL IN MEDLEY FARM SITE VICINITY:

<u>Sprouse Well (2)</u>	<u>Date of Collection</u>		
	<u>June 27, 1983(2)</u>	<u>September 12, 1983 (2)</u>	<u>July 18, 1984 (2)</u>
1) methylene chloride	14.0	0	678 ug/L
2) 1,2-dichloroethane	*	*	2.51 ug/L

* - No value given in SCDHEC analytical results.

References: 1. Workman, 1984(a) (see Work Plan)
2. Workman, 1984(b) (see Work Plan)

Locations of the residential wells and certificates of analysis for the July, 1984 SCDHEC investigation are documented in the approved Medley Farm RI/FS Work Plan. No further analyses of soil or ground water from the site are known to have been performed between July, 1984 and commencement of Phase I RI sampling in January 1989.

The extent of potential residual soil contamination at the Medley Farm site was not defined in these early evaluations. Any visually contaminated soil located on-site was either removed or covered with clean earth during the removal operation performed in June and July, 1983. No sampling of surface waters or stream sediments was conducted prior to this RI in Jones Creek, the Big Blue Branch, or Thicketty Creek.

The Medley Farm site was subsequently evaluated by the EPA in June, 1985, using the Hazard Ranking System (HRS). A migration score of 31.58 was assigned based entirely on the ground-water route. The Medley Farm site was proposed for addition to the National Priority List (NPL) in June, 1986. In March, 1990, the Medley Farm site was placed on the NPL and was ranked 850 (Federal Register, March 14, 1990). As of August, 1990, the Medley Farm site was ranked 918 on the National Priorities List (Federal Register, August 30, 1990).

2.2.4 Domestic Wells and Municipal Water Supply

As mentioned in Section 2.2.3, four private domestic water supply wells (Sprouse, Sarrett, Davis, Pittman) were located and sampled by SCDHEC during 1983 and 1984. One additional private domestic water well (Solesbee) was brought to SCDHEC's attention and sampled in December 1984. One private water well (the Ralph Medley well) is present on site but has not been sampled since hydrogeologic investigations performed during this study indicate that the Ralph Medley domestic water supply well is located upgradient of the former disposal site. In November 1990, Sirrine reviewed the South Carolina Water

Resource Commission's (SCWRC) domestic water supply well files in an attempt to identify any additional information or locations of supply wells for this area. The only private domestic water wells listed within the one mile radius around the Medley Farm site were the Sprouse, Sarrett, Davis, and Pittman wells. The locations of these wells, as well as the Medley and Solesbee well are presented on Figure 2.5. Also presented on Figure 2.5 are the approximate locations of the municipal water supply lines within a mile radius of the Medley Farm site. The location of the water lines was provided by Draytonville Water Works, Inc.

2.2.5 Site Description and Topography

The Ralph Medley Farm occupies 61.9 acres of rural land located approximately six miles south of Gaffney, South Carolina in Cherokee County on County Road 72 (Burnt Gin Road). The Medley Farm site consists of an approximately seven-acre section of the Ralph Medley Farm parcel that is situated on top of a small hill. The approximate center of the site is located at latitude 34°58'54" north and longitude 81°40'02" west. The surrounding land is hilly and consists mainly of woods and pasture land. The land use in the vicinity of the site is primarily agricultural (farms and cattle) and light residential.

Ground surface elevations at the Medley Farm property range in elevation from El. 558 feet, National Geodetic Vertical Datum (NGVD), at Jones Creek, to El. 689 feet NGVD at the highest point on the site. The nearest bench mark located approximately 1.4 miles northeast of the site is at El. 814 feet. This elevation represents a maximum elevation for the immediate region (approximate two mile radius) surrounding the Medley Farm site. The lowest elevations occur in the Thicketty Creek drainage basin (approximate elevation 500 feet). Topography of the site area is relatively flat with slopes ranging from three to 10 percent. The land surrounding the site slopes off steeply to the east and south with slopes ranging from 10 to 52 percent. The site is covered with weeds, briars, and small scrub

trees but the remainder of the Medley property is mostly a dense forest of hard and softwood. Based on observations of site topography, surface drainage occurs to the northeast and east, to the southeast, and to the south and southwest into tributaries of Jones Creek. These drainage areas are fed by several smaller, intermittent ravines and ditches surrounding the site. It is apparent that surface drainage does not occur to the immediate north-northwest of the site. Surface drainage from the Medley Farm property eventually discharges to Jones Creek which in turn discharges to Thicketty Creek approximately 1.5 miles from the Medley Farm property. Thicketty Creek eventually drains into the Broad River. The topographic features at the Medley Farm site are presented on Figure 2.1.

2.2.6 Climate

The climate in the Gaffney, South Carolina (Medley Farm) area is relatively mild. The area is located on the eastern slope of the Appalachian Mountains and is usually protected from the full force of the cold air masses which move southeastward from central Canada during the winter months. Due to the elevation of the area, it is conducive to cool nights, especially during summer months. The temperature rises to 90°F or above on almost half of the days during the summer, but usually falls to 70°F or lower during the night. Winters are quite pleasant, with the high temperatures averaging 53°F and the low averaging around 32°F. Rainfall in this area is usually abundant, averaging 52 inches a year or 4.3 inches a month. Droughts have been experienced, but are usually of short duration (National Oceanic and Atmospheric Administration, 1980).

The mountain ridges, which lie northwest of the Site area in a northeast-southwest orientation, appear to have a definite overall influence on the direction of the wind. The prevailing wind directions are almost evenly divided, with prevailing winds from the northeast during fall and winter, and from the southwest during the spring and summer months.

Destructive winds occur occasionally although tornadoes are infrequent in this vicinity. Table 2.3 shows the monthly and annual water budget for the Spartanburg, South Carolina area. The period covers 1951-1980, and all values are averaged. The contribution to runoff and seepage into ground water can be assumed to be equal to the annual difference between total precipitation and evapotranspiration (12.29 inches). The data were calculated using monthly temperatures and precipitation from 12 stations in the Upstate of South Carolina. Stations in Spartanburg, Gaffney, and Greenville were included. These values represent large area "averages" for soils in the Piedmont.

2.2.7 Regional Geology

South Carolina is divided into three physiographic provinces: the Atlantic Coastal Plain, which occupies the southeastern half of the state; the Piedmont province, occupying most of the northwestern half; and the Blue Ridge province, occupying a narrow band in the extreme northwest (Overstreet and Bell, 1965). The Medley Farm site is located in the Piedmont Province. The physiographic provinces and the Medley Farm site location are illustrated in Figure 2.6.

The Piedmont physiographic province is characterized by fractured and faulted igneous and metamorphic rocks of Precambrian and Paleozoic age. These crystalline rocks are grouped by their grade of regional metamorphism into six northeast-southwest trending lithologic belts. The belts are, from southeast to northwest: the Carolina Slate Belt, the Charlotte Belt, the Kings Mountain Belt, the Inner Piedmont Belt, the Brevard Belt, and the Blue Ridge Belt. The Medley Farm site is situated near the transition zone between the Charlotte Belt and the Kings Mountain Belt as shown on Figure 2.7.

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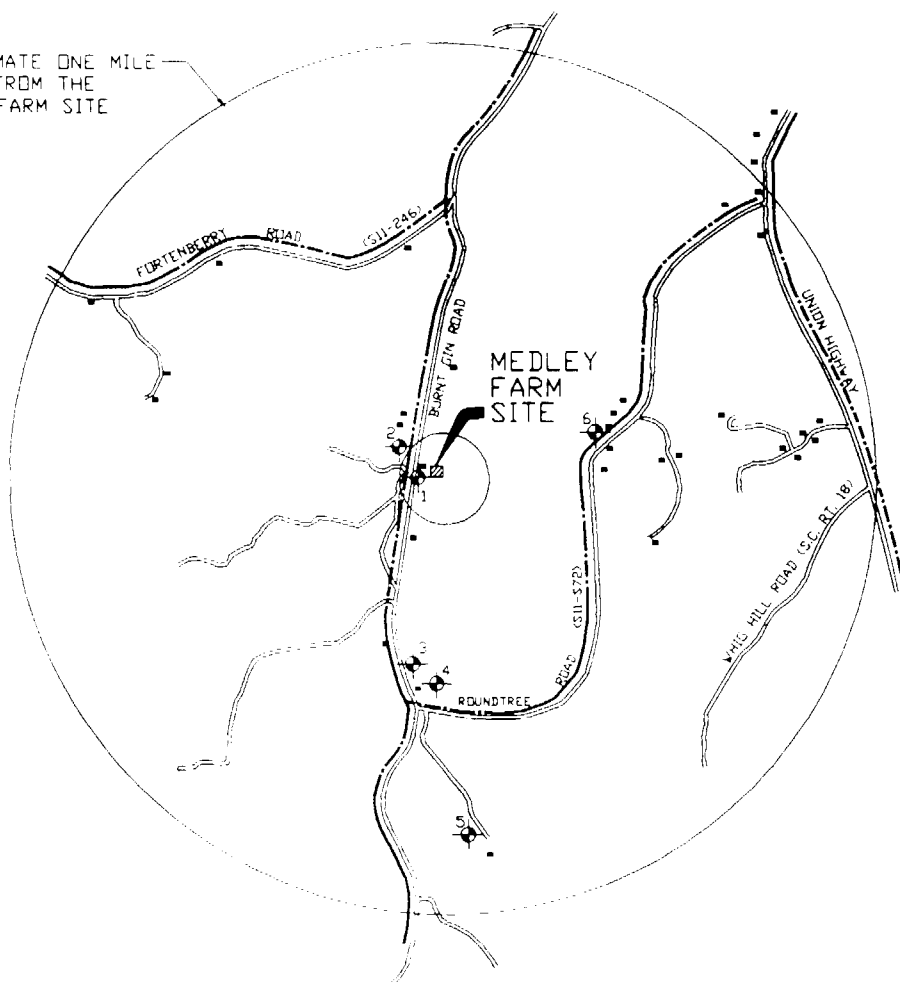
Table 2.3
Annual Water Budget 1951-1980

<u>Month</u>	<u>Evapotranspiration</u> (inches)	<u>Total</u> <u>Precipitation</u> (inches)	<u>Contribution to Run-Off</u> <u>and Ground Water</u> (Precipitation–Evapotranspiration)
January	.49	4.17	3.68
February	.59	4.13	3.54
March	1.27	5.58	4.31
April	2.64	4.21	1.57
May	4.59	4.08	-.51
June	6.36	4.79	-1.57
July	6.98	4.38	-2.60
August	6.36	3.94	-2.42
September	4.53	4.37	-.16
October	2.48	3.27	.79
November	1.02	3.14	2.12
December	.47	4.01	3.54
Annual	37.78	50.07	12.29

Note: Data supplied by the Agricultural Weather Office in Clemson, South Carolina.

APPROXIMATE ONE MILE
RADIUS FROM THE
MEDLEY FARM SITE

3 10 0134



LEGEND



APPROXIMATE LOCATION OF MEDLEY FARM SITE



APPROXIMATE LOCATION OF WATER SUPPLY WELLS
ON RECORD WITH S.C. DHEC AND S.C. WRC
OWNERS OF RECORD ARE IDENTIFIED AS FOLLOWS

- 1 RALPH MEDLEY
- 2 DOROTHY SPROUSE
- 3 JAN SARRETT
- 4 DAVIS FAMILY
- 5 ROBERT PITTMAN
- 6 ROBERT SOLESBEE



APPROXIMATE LOCATION OF MUNICIPAL
WATER SUPPLY LINES



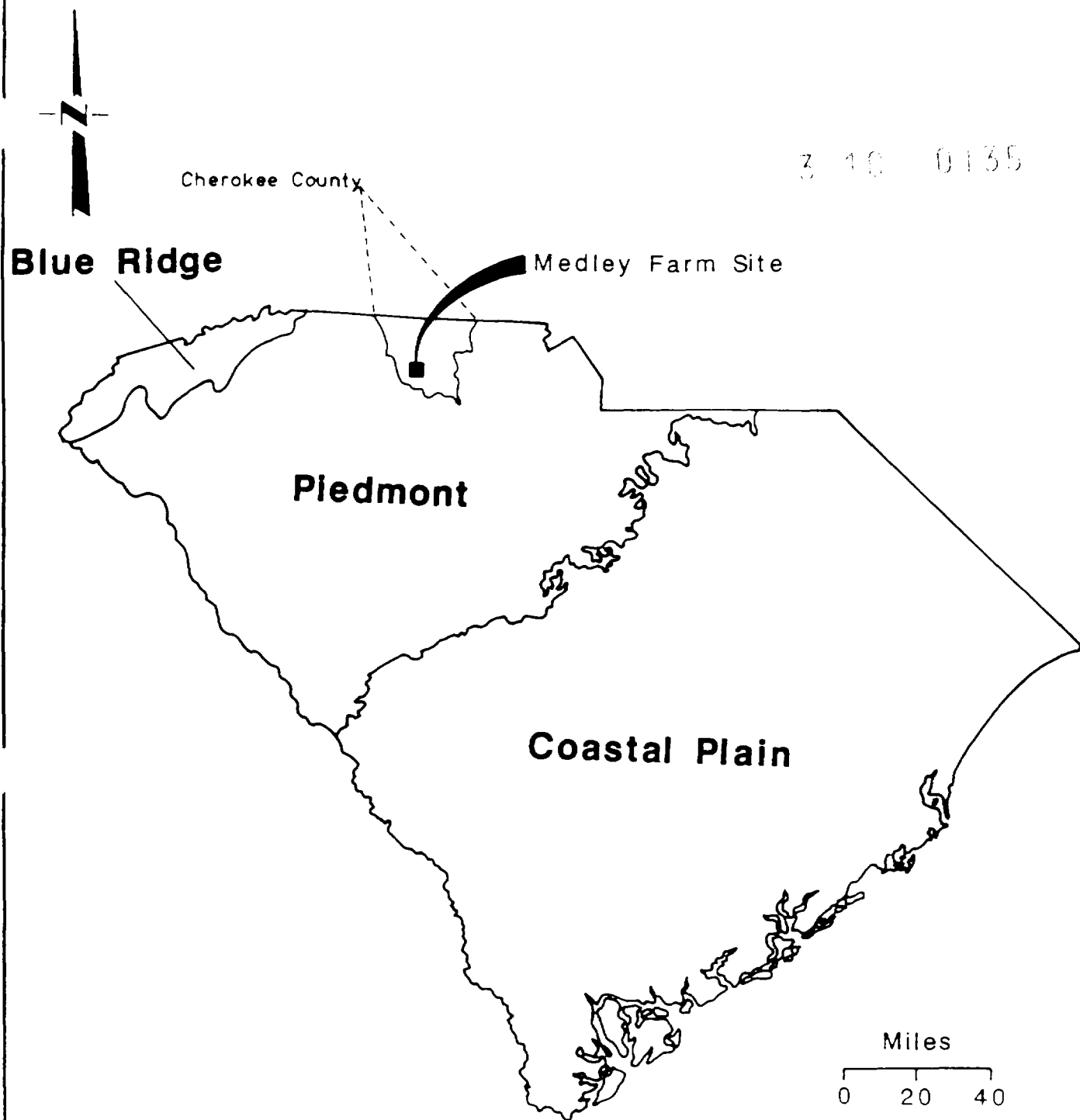
APPROXIMATE LOCATION OF BUILDINGS
SHOWN ON USGS TOPOGRAPHIC MAP

NOTES

1. LOCATION OF WATER SUPPLY WELLS
OBTAINED FROM THE SOUTH CAROLINA
DEPARTMENT OF HEALTH AND ENVIRONMENTAL
CONTROL AND THE SOUTH CAROLINA WATER
RESOURCES COMMISSION BY SIRRINE, NOV. 1990.
A DOOR-TO-DOOR SURVEY WAS NOT PERFORMED
FOR THIS STUDY.

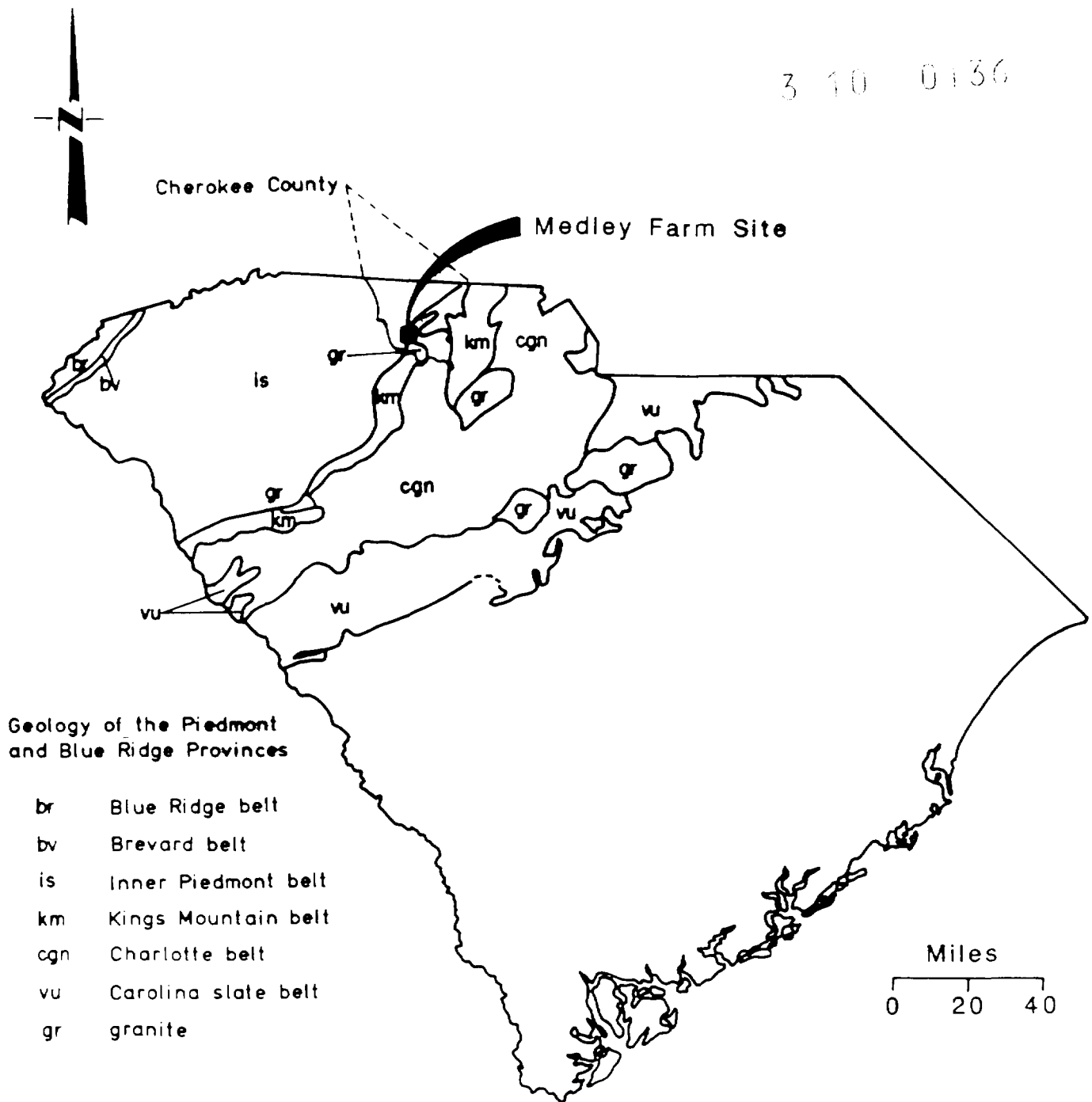
2. LOCATION OF WATER LINES SUPPLIED BY
DURATONVILLE WATER WORKS, INC. NOV. 1990.

3. LOCATIONS OF BUILDINGS TAKEN FROM
USGS TOPOGRAPHIC MAP, PATCH 1, MILES
QUADRANGLE, 1989.



Physiographic Provinces of
South Carolina
(Adapted from Cooke, 1936 and Siple, 1967)

3 10 0136



Geology of the Piedmont and Blue Ridge Provinces

- br Blue Ridge belt
- bv Brevard belt
- is Inner Piedmont belt
- km Kings Mountain belt
- cgn Charlotte belt
- vu Carolina slate belt
- gr granite

Lithologic Belts of the Blue Ridge and Piedmont Provinces of South Carolina

(Belt Boundaries Adapted from Cooke, 1936 and Overstreet and Bell, 1965)

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Figure 2.7
Medley Farm Site RI
Gaffney, South Carolina

The Charlotte Belt was formed by a mid to late Paleozoic metamorphic event which metamorphosed layered volcanic and sedimentary rocks of late Precambrian and early Paleozoic age. The belt is a zone of medium-to-high grade metamorphic and plutonic igneous rocks. The dominant lithologies are gneisses, schists and amphibolites, all of which are heavily intruded by plutons of varying compositions and ages (Overstreet, 1970).

The Kings Mountain Belt is situated adjacent to the western margin of the Charlotte Belt. This belt is characterized by rocks of lower metamorphic grade (biotite to garnet grade) than those of neighboring belts and includes amphibolite, quartzite, muscovite schist, metasilstone, marble and intrusives of varying composition. The rocks, originally comprised of late Precambrian and early Paleozoic sediments and volcanic deposits, were also metamorphosed during mid to late Paleozoic time (Overstreet, 1970).

The arrangement and present structure of these geologic belts were formed when layers of sedimentary, volcanic, and igneous rocks were metamorphosed by the collision of the North American and African Plates in the late Precambrian to early Paleozoic about 345 to 500 million years ago (Overstreet and Bell, 1965; Hatcher, 1972). During the latter part of the collision, the folded rock layers were faulted and subsequently intruded by igneous rocks. The regional strike of the rocks is to the northeast and regional dip is southeast.

3.0 RI SITE INVESTIGATIONS

3 10 0135

3.1 OVERVIEW

All RI field activities were performed and documented in accordance with the EPA Region IV Standard Operating Procedures and Quality Assurance Manual (April, 1984) and procedures described in detail in the approved Project Operations Plan (P.O.P.) prepared for this project by Sirrine Environmental Consultants (January, 1989). Final approval of this plan was granted by the Agency in a letter dated May 16, 1989, addressed to King & Spalding from Jon K. Bornholm, the Superfund Project Manager from EPA Region IV on this project. The Agency approved the use of the alternate decontamination procedures (steam cleaning) for drilling equipment described in the P.O.P. Approval for performance of the soil gas survey and Phase IA test pit excavation and source characterization was provided by the Superfund Project Manager to expedite the project schedule.

Specific objectives for all field activities and the rationale for the selection of sampling locations are described in the following sections. Copies of correspondence between Sirrine and the Agency pertinent to final approval of the P.O.P., and selected excerpts from the P.O.P. describing the details of standard field procedures utilized during this RI, are presented in Appendix A of this document. Any deviations from these procedures and significant observations made during performance of field activities are also presented in the following sections.

3.2 SOIL GAS SURVEY

3.2.1 Objectives

A soil gas survey was conducted prior to all other RI subsurface investigations and sampling efforts. The purpose of the soil gas survey was to identify former lagoon and drum storage areas for source characterization sampling by determining the primary locations of residual chemicals present in soils. Because existing data indicated that VOCs

were the primary and most mobile contaminants of concern at the Site, this technique was used as a screening tool to select optimum locations for direct sampling. Data generated from the soil gas analyses was used in conjunction with the existing data base to finalize proposed locations for test pits and soil borings. The results of chemical analyses performed on soil samples collected from the test pits and soil borings was used to confirm interpretation of the soil gas survey results.

3.2.2 Survey Design and Collection of Data

PETREX® soil gas collectors were installed at a total of 123 locations at the Site. The sampling locations were based on a rectangular grid system with samples spaced 50 feet apart in the most likely source areas of former drum storage and lagoon locations. A 100 foot grid spacing was utilized outside of these areas for additional screening. Details on the preparations, installation, collection and analysis of the receptors were described in the approved Medley Farm Site Projects Operation Plan (POP) (Appendix B) and can be found in the PETREX® Final Report along with isopach maps of relative ion flux data for the four primary groups of VOCs identified by the soil gas analyses (Appendix B). The locations of test pits excavated during the RI were added to the soil gas isopach maps included in the PETREX® report.

3.3 TEST PIT EXCAVATION AND SOURCE CHARACTERIZATION

3.3.1 Objectives and Rationale

The test pit program was designed to provide initial source characterization in and around suspected lagoon and drum storage areas. The objective of the source characterization was to determine the potential presence and remaining concentrations of residual chemicals, if any, at each of the known and suspected disposal and storage areas. Test pits were excavated to collect composite samples of any exposed waste materials to accomplish this objective. This information will be used primarily to evaluate alternatives for source control in the FS. The test pits enabled direct visual characterization of former

lagoon bottom conditions and sampling of residual wastes which were present. Where residual sludges were not exposed composite soil samples were collected.

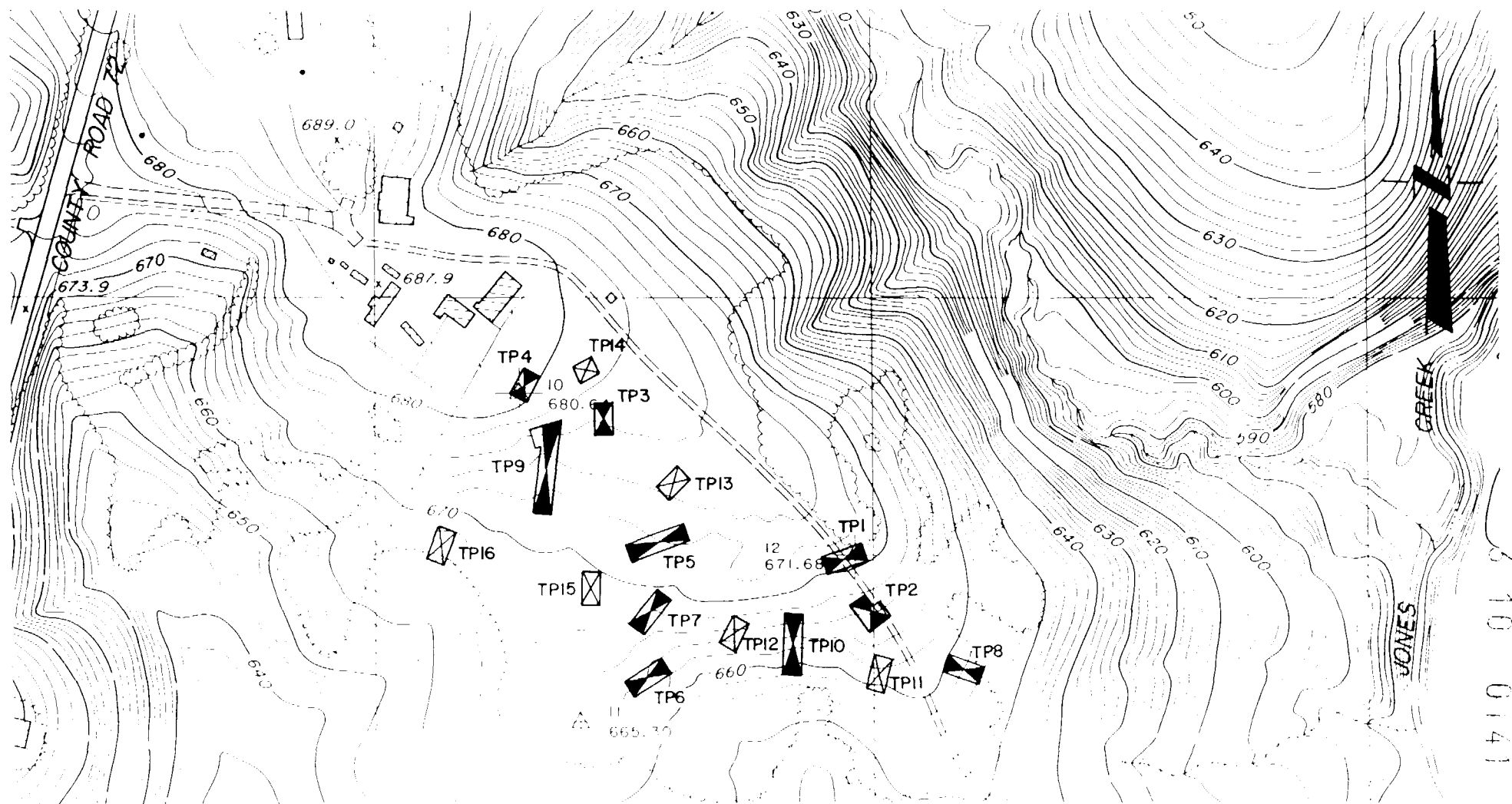
A total of 15 test pits were proposed for the RI. Eight were scheduled for Phase IA to provide sampling and analyses for the selection of site specific indicator parameters. The need for approximately seven additional test pits was estimated in the Work Plan for Phase IB. Ten test pits were actually excavated during Phase IA to assure that potential lagoon sites were thoroughly investigated. The typical length of Phase IA test pits was also extended significantly for this purpose. Soil samples were collected and analyzed for TCL/TAL compounds during this phase from eight test pits as scheduled. During Phase IB, six test pits were excavated at locations approved by EPA (See appendix A) based upon data obtained from Phase IA. The test pit excavations were performed by Fenn-Vac, Inc. of Charleston, South Carolina during Phase IA and by Environmental Drilling Services, Inc. of Anderson, South Carolina during Phase IB. The locations of test pits excavated during the RI are presented on Figure 3.1 and are also included on isopach maps contained in the PETREX® report (Appendix B).


The rationale for the selections of each test pit location is presented below:


Phase IA:

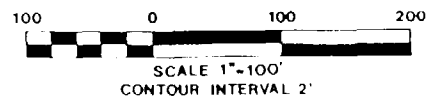
- TP1, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10; These test pits were located in and around the former lagoon and drum storage areas to provide initial source characterization to determine the potential presence and remaining concentrations of any residual contaminants.

The analytical results of soils collected from these test pits were used to develop the soils indicator parameter list to be used for subsequent soil analyses.



 Location and Extent of Test Pits Excavated During RI-Phase IA (Feb.-Mar., 1989)

 Location and Extent of Test Pits Excavated During RI-Phase IB (Dec., 1989)



SIRRINE
ENVIRONMENTAL
CONSULTANTS
Greenville, South Carolina

Subsurface Exploration Locations
Test Pits
Medley Farms Site
Gaffney, South Carolina

Figure 3.1

- TP2; This test pit was to investigate the electromagnetic anomaly identified in the conclusions of the NUS geophysical study as a potential "buried drum" location.

Phase IB:

- TP11, TP12, TP13, TP15, TP16; These test pits were located around the former disposal area based on further inspection of the SCDHEC aerial photograph, which was taken of the Medley Farm site prior to the EPA immediate removal action and the Phase IA test pit excavation data. These test pits provided additional information about the horizontal distribution of any contaminants.
- TP14; This test pit was located in a former lagoon and drum storage area to provide further information on the areal extent of the lagoonal structure located in Phase IA by TP4, TP3, and TP9.

3.3.2 Phase IA Activities and Observations

During Phase IA, 10 test pits were excavated in and around the six former lagoon areas identified from the previous Site investigations.

The area identified in the NUS geophysical study of the Site (1983) as a potential buried drum site was included in this investigation (test pits TP1 and TP2). No buried drums or evidence of previous excavation in this area or any other area of the Site were encountered. The Phase IA test pits were excavated during February and March, 1989. A Case 480E rubber tire back-hoe with a 12 to 14-foot depth capability and a 24-inch-wide bucket was used. The test pits ranged in size from 34 to 75 feet in length, 2.5 to 7.0 feet in width, and 1.5 to 5.0 feet in depth. All test pits fully penetrated any fill material present at the site and were terminated only after natural, undisturbed residual soils or saprolite were observed at the bottom of each excavation by the field geologist.

The test pits revealed that the top soil at the Medley Farm Site is relatively thin, apparently due to the excavation and grading activities conducted during the emergency response action in 1983. The topsoil that does exist is predominantly silt or clayey silt with traces of fine sand in certain areas. Below the topsoil, a silty clay or clayey silt residual soil was generally observed. At several locations, saprolite was encountered directly beneath the thin layer of topsoil. The saprolite exposed in the test pits appears to have originated from the weathering of a mica schist or schistose gneiss and is predominantly a silt or clayey silt.

In four of the 10 test pits excavated during Phase IA, evidence of former lagoons or other remnants of disposal activities was encountered (TP3, TP4, TP5, and TP10). Waste materials encountered consisted of minor pockets of residual sludges, (one to two inches thick), plastic sheeting, drum lids, one empty deteriorated 55-gallon drum, various types of gelatinous or resinous materials, cinders or fly ash, and asphalt. Layers of matted grass, leaves, and twigs were typically observed beneath the thin layers of buried sludge encountered. Stained soils of various colors were also observed. Residual source materials encountered were of such limited extent that detailed delineation of these materials was not made.

Detailed logs including descriptions of waste materials and soils encountered in all test pits are presented in Appendix C. Table 3.1 provides a detailed summary of materials encountered and observations made during test pit excavation.

Soils were collected for analysis from eight of the ten test pits excavated during this phase of the RI, in accordance with the approved Work Plan and POP. Test pit samples submitted for analysis were selected by screening each test pit with an organic vapor analyzer (OVA) and making a visual assessment to determine the most appropriate locations for source characterization sampling. Composite samples were made up of any residual sludges encountered and soils which were stained or responded to OVA screening. The objective was to provide representative samples of any residual source materials

TABLE 3.1
MEDLEY FARM SITE RI
SUMMARY OF TEST PIT RESULTS

Test Pit Number	Dimension (Feet)			Description of Test Pit Contents ¹	OVA Results (ppm)	Concentrations of Volatiles and Semivolatiles (µg/kg)	Corresponding Soil Boring
	L	W	D				
TP1	52	2.5	1.5	Silty top soil/silty clay saprolite	0 in breathing zone	acetone@ 12	none
TP2	34	3	3	Sand with silt fill/silty clay residual soil/saprolite	0 to low	total xylene @ 3.7 2-methylnaphthalene @ 550	SB5
TP3*	34	7	3.5	Silty clay fill, brown to dark brown and greenish; pockets of purple silty sand and bright yellow sand in a few places. Plastic sheets lined bottom of fill material at northern end of trench with gummy material intermixed with plastic sheeting.	20-30 typical in breathing zone; 700-800 while sampling.	1,1-DCE @ 140E; 1,2-DCE @ 12000E, benzene @ 600E; carbon disulfide @ 450E; chlorobenzene @ 2500E; ethylbenzene @ 1200E; trichloroethene @ 12000E; vinyl chloride @ 500E; total zylene @ 3900E; 1,2,4- trichlorobenezene @ 710000D	SB3

2100144

TABLE 3.1 (CONTINUED)

MEDLEY FARM SITE RI
SUMMARY OF TEST PIT RESULTS

Test Pit Number	Dimension (Feet)			Description of Test Pit Contents ¹	OVA Results (ppm)	Concentrations of Volatiles and Semivolatiles (µg/kg)	Corresponding Soil Boring
	L	W	D				
TP4*	39	5	5	Silty clay/clayey silt fill, mottled red-brown and gray with occasional yellow-white, purple and black patches; occasional pockets of gummy glue-like materials; 4 or 5 drum lids encountered and a complete 55 gallon drum (fell apart completely when encountered)	30-40 typically 100 peak off of pit walls	1,1-DCE @ 14; 1,1-DCA @ 47; 1,1,2,2-tetrachloroethane @ 3400E; 1,2-DCE @ 730E; 2-butanone @ 81; 4-methyl-2-pentanone @ 15; acetone @ 2300E, benzene @ 160; chlorobenzene @ 360E; ethylbenzene @ 110; methylene chloride @ 800E; PCE @ 5400E; toluene @ 1300E; trichloroethene @ 6600E; vinyl acetate @ 13; total zylene @ 620E; 1,2,4-trichlorobenzene @ 240000D; acenaphthalene @ 75000; phenol @ 94000D	SB2
TP5*	63	4	4.5	Silt with sand fill with some fly ash or road-grade asphalt. Plastic bags and other debris noted. Voids from decayed 55 gallon drums were observed.	0 in breathing zone; to 15 at trench walls	trichloroethene @ 8; Bis(2-ethylhexyl)phthalate @ 161000	SB4

2 10 0145

TABLE 3.1 (CONTINUED)

MEDLEY FARM SITE RI

SUMMARY OF TEST PIT RESULTS

Test Pit Number	Dimension (Feet)			Description of Test Pit Contents ¹	OVA Results (ppm)	Concentrations of Volatiles and Semivolatiles (µg/kg)	Corresponding Soil Boring
TP6	4	2.5	2.5	Sandy silt topsoil with a few plastic bags. Silty residual soil.	0	none detected	SB6
TP7	46	2.5	3	Topsoil and gravelly sand and silt fill. Clayey silt residual soil.	0 in breathing zone; 4 at one sampling location.	trichlorethene @ 280D; Bis(2-ethylhexyl)phthalate @ 630	none
TP8	38	2.5	2	Sandy silt topsoil. Saprolite and clayey silty residual soil.	0-4	2-butanone @ 1000; 4-methyl-2-pentanone @ 390; acetone @ 870; total xylene @ 170	SB7
TP9	75	3	3.5	Silty sand topsoil/fill; silty clay fill/residual soil. Occasional pockets of yellow and purple stained soils and gray ash-like material in topsoil/fill (0-0.3 foot depth)	No data	acetone 580DE	none
TP10*	60	2.5	3.5	Silty gravel, gray-green to brown with purple zones in 0-0.3 foot depth.	No data	None detected	none

3 10 0146

TABLE 3.1 (CONTINUED)

MEDLEY FARM SITE RI
SUMMARY OF TEST PIT RESULTS

Test Pit Number	Dimension (Feet)			Description of Test Pit Contents ¹	OVA Results (ppm)	Concentrations of Volatiles and Semivolatiles (µg/kg)	Corresponding Soil Boring
	L	W	D				
TP11	32	2.5	5.5	Very little or no topsoil; silty clay residual soil.	0 but strong organic odor	None detected	none
TP12	35	2.5	4.5	Clayey silt topsoil. Silt- silty clay residual soil. Some purple stained areas at surface in topsoil.	0	1,2-DCE @ 90; PCE @ 3J; trichloroethene @ 31D	none
TP13	23	2.5	6.2	Silt topsoil; silty clay fill; silty clay residual soil.	0	methylene chloride @ 24	none
TP14*	28	3.5	7.4	Silt topsoil; silt saprolite; silty clay residual soil. Appeared to be an old ditch or edge of lagoon. Dark brown sludge and green/milky-white resinous material.	1-6 in. breathing zone; 100-150 material in backhoe bucket.	1,2-DCE @ 250; ethylbenzene @ 70; methylene chloride @ 31; PCE @ 10; toluene @ 15; vinyl chloride @ 69; total xylene @ 250	SB9
TP15	29	2.5	6.5	Silt topsoil; clayey silt fill; silty clay residual soil.	0	trichloroethene @ 16	none
TP16	30	2.5	6	Clayey silt topsoil; silty clay fill; clayey silt with sand residual soil.	0	None detected	none

310 0147

TABLE 3.1 (CONTINUED)

MEDLEY FARM SITE RI
SUMMARY OF TEST PIT RESULTS

Test Pit Number	Dimension (Feet)			Description of Test Pit Contents ¹	OVA Results (ppm)	Concentrations of Volatiles and Semivolatiles (µg/kg)	Corresponding Soil Boring
	L	W	D				

Notes:

1-information is from Appendix B of the RI report

* indicates probable former disposal/lagoon site

1,1-DCE = 1,1-dichlorethene

PCE = tetrachloroethene; perchloroethylene

1,1-DCA = 1,1-dichloroethane

1,2-DCA = 1,2-dichloroethane

1,1,1-TCA = 1,1,1-trichloroethane

1,1,2-TCA = 1,1,2-trichloroethane

D = sample diluted for this analyte

E = estimated result. Analyte concentration exceeds the instrument calibration range

310 0148

exposed in the excavations rather than samples of underlying soils. The analyses of these samples, therefore, reflect residual materials, not overall soil conditions.

Each composite sample was made up of approximately equal portions collected from four discrete locations in each test pit. The VOC samples were collected from each test pit prior to other sample collection to minimize volatilization of organics. Samples required for other analytical fractions were then collected and composited from the same four locations in each test pit. All samples collected during Phase IA were composited in accordance with the approved Work Plan. Samples were composited immediately in the field by mixing in a stainless steel bowl. Samples collected during this sampling event were subjected to complete TCL/TAL analysis.

Sample collection and the results of analyses performed on samples collected from all test pits excavated during the RI are discussed in Section 5.4 of this report.

3.3.3 Phase IB Activities and Observations

Six test pits were excavated during Phase IB at the Site in December, 1989. Two test pits were located in suspected lagoon areas and four in various locations around the Site. The number and locations of all Phase IB test pits were approved by the EPA RPM prior to initiation of these activities. Sampling from these test pits also focused on residual source materials. Sampling procedures and field screening was the same as for Phase IA. The test pits were excavated using a Case 580E rubber tire back-hoe with a 12 to 14-foot depth capability and a 24-inch-wide bucket. The test pits ranged in size from 23 to 35 feet in length, 2.5 to 3.5 feet in width, and 4.5 to 7.4 feet in depth. All test pits excavated during this phase of the RI were also extended completely through any fill present at the site and well into natural, undisturbed residual soil or saprolite.

The test pits excavated during this phase revealed the same general soil conditions as those described for the Phase IA test pit activities in Section 3.3.2. Only one test pit excavated during Phase IB encountered evidence of a former lagoon (test pit TP14). Waste

material observed at this location consisted of a dark brown sludge of varying consistency and a large piece of green and milky-white resinous material. Detailed logs of test pits excavated during Phase IB are also presented in Appendix C.

Phase IB samples were subjected to the approved indicator parameter analyses (VOCs and SVOCs) developed from the evaluation of Phase IA analytical results.

3.4 SURFACE SOIL SAMPLING

3.4.1 Objectives

Surface soil samples were collected and analyzed during the Phase II RI primarily to supplement and/or provide additional data to complete the risk assessment. The specific objectives of the surface soil sampling were to:

- Determine the concentrations of contaminants in surface soils to provide data required to complete risk assessment calculations with respect to dermal exposure and ingestion of soils;
- Document the range of concentrations of inorganic constituents (metals) occurring naturally in soils at the Site with background surface soil samples.
- Based upon consideration of SCDHEC comments, surface soil samples collected from the former disposal area were analyzed for PCBs to provide further evaluation of potential PCB concentrations in soils at the sites.

The rationale for the selection of each surface soil sampling location is presented below:

- HA1 through HA10, HA12; These surface soil locations were located on approximately a 100 foot grid system. Slight deviations were made from this grid to acquire surface soil samples from areas of known subsurface contamination, to verify clean fill placed during the immediate removal action, and/or check along the transport roadway for possible surface contamination.
- HA11; This surface soil sampling location was located due south of the former disposal area in a topographic low along a suspected major surface water/sediment drainage route.
- HA13, HA14, HA15; These surface soil sampling locations were selected in areas distant from the influence of previous disposal activities at the site to the extent possible based on knowledge of site history and landscape position. These samples were to document the range of soil inorganic concentrations occurring naturally in soils of the site.

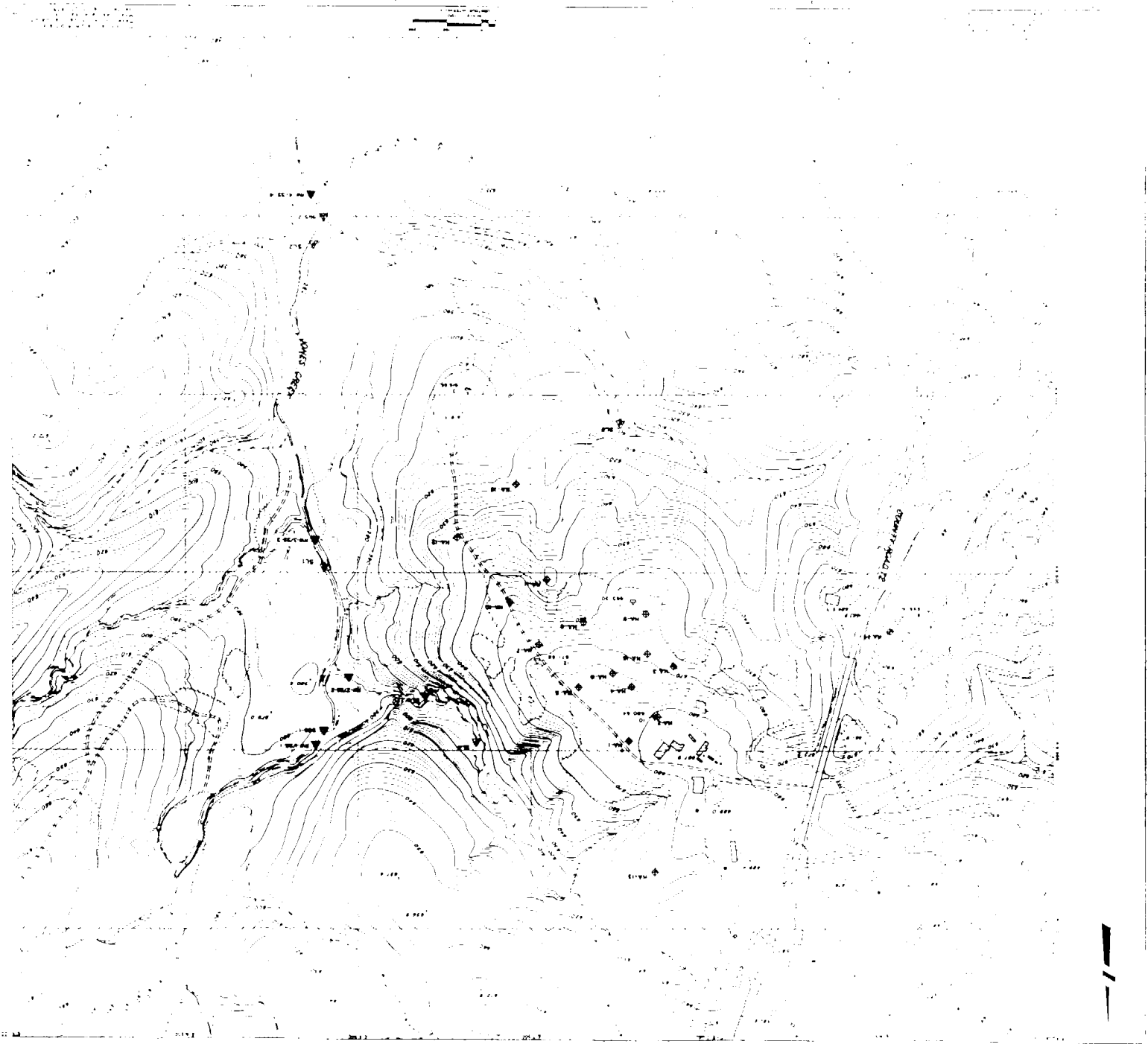
3.4.2 Sample Collection

Surface soil samples were collected from a total of sixteen locations during the Phase II RI. Twelve of these samples (HA1 thru HA12) were collected from the former disposal area and around its perimeter and were subjected to TCL-Volatile and Semi-Volatile organics analyses as proposed in the Phase II RI Work Plan. Samples collected from these twelve locations were also analyzed for PCBs during Phase II after consideration of comments from SCDHEC. Samples were collected for PCB analyses at a later date from the same staked locations as sample subjected to organic analyses. These samples were therefore assigned the same sample numbers. Samples collected for PCB analyses were collected using stainless steel hand augers in accordance with all surface soil sampling protocols approved for this project. An additional sampling location was added to the Phase II scope due to an error by the laboratory in handling the semi-volatile organic duplicate sample collected for analysis from the HA6 location. This additional location was numbered HA16 and was sampled for TCL-Semi-Volatile organics only along with an additional QA/QC duplicate.

Background samples were collected from the remaining three locations (HA13 thru HA15) in areas verified to be representative of natural, undisturbed soil conditions based on soil morphologic characteristics. Surface soil samples collected from the three background locations were analyzed for TAL metals only. Surface soil sampling locations are presented on Figure 3.2.

The samples collected in the former disposal area and its perimeter were sampled using properly decontaminated stainless steel implements. At each sample location, the surface vegetation was removed and representative soil samples were collected in the 0-12 inch zone using a stainless steel hand auger. Samples were containerized and labeled according to methods established in the POP.

The three background sampling locations represent three composite samples with three sub-samples in each. All sampling was performed with properly decontaminated stainless steel implements. At each composite sample location the surface vegetation was removed using a stainless steel spade/trowel, and the hole was advanced to a depth of approximately 6 inches using a stainless steel hand auger. The sampling depth was in the 6 to 24 inch depth zone, depending on morphologic properties. This flexibility in sampling depth enabled the field scientist to sample the zone of maximum clay accumulation and thereby characterize the upper range of metals concentrations. Within each composite zone (HA13-HA15) three sub-samples were collected. Auger cuttings from the three sub-samples for each composite zone (HA 13 for example) were composited into a stainless steel bowl and mixed with a stainless steel utensil. A sample was then collected and carefully placed in glass containers and labeled according to location, depth and analysis in accordance with the Project Operations Plan.



3.5 SOIL BORINGS

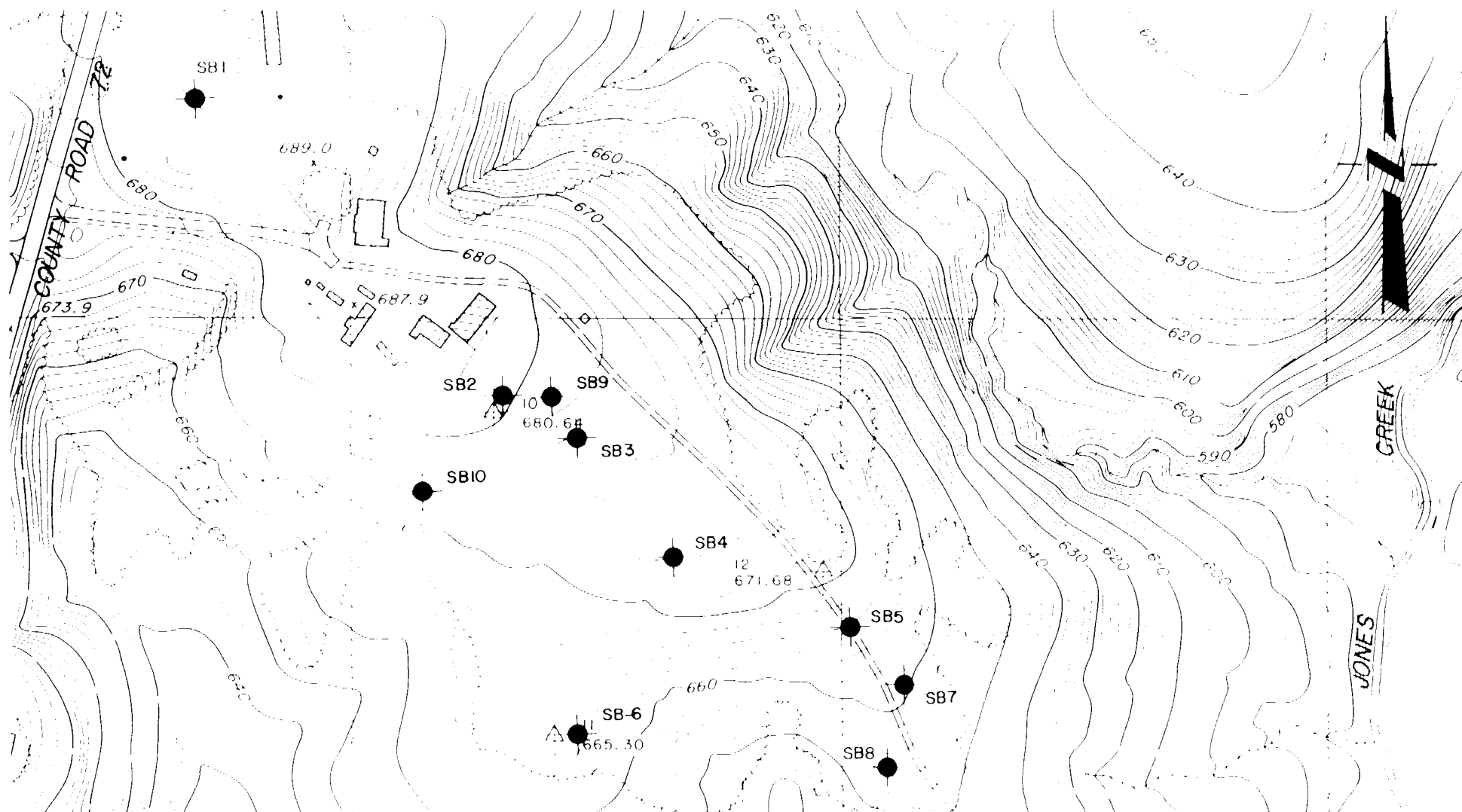
3 10 0156

3.5.1 Objectives and Rationale

A total of 10 borings were drilled during Phase IB of the RI between January 9 to January 24, 1990. The borings were drilled in and around confirmed source areas to further investigate the vertical and horizontal extent of residual chemicals in the soils. The locations of the borings, designated SB1 through SB10, were based on field observations and data obtained during the test pit investigations. Concurrence on soil boring locations was obtained from EPA prior to drilling. The location of the soil borings are shown on Figure 3.3.

The rationale for the selection of each soil boring location is presented below:

- SB1; This soil boring was located approximately 180 feet northwest of the former disposal area of the Medley Farm site in a background location.
- SB2, SB3, SB4, SB9; These soil borings were located at former lagoon sites confirmed during Phase IA and Phase IB test pit excavations.
- SB5; This soil boring was located in the area where the NUS geophysical survey indicated an anomaly that could potentially indicate buried drums. This location was placed next to test pit TP2 to further investigate this possibility.
- SB6, SB7, SB8, SB10; These soil borings were located in areas of probable drum storage and/or lagoon locations based on evaluation of SCDHEC aerial photographs of the site prior to the immediate removal action, NUS survey, and Phase IA results.



● Location of Soil Borings Drilled
During RI Phase IB (Jan., 1990)



SIRRINE
ENVIRONMENTAL
CONSULTANTS
Greenville, South Carolina

Subsurface Exploration Locations
Soil Borings
Medley Farm Site
Gaffney, South Carolina

Figure 3.3

3.5.2 Subsurface Soil Sampling

The soil borings were drilled with a Mobile B-33 and a CME-55 drill rigs using 8.0-inch outside diameter (O.D.) hollow stem augers. The drilling was accomplished by Environmental Drilling and Services, Inc. and Froehling and Robertson, Inc. under Sirrine supervision. Each boring was advanced to a maximum depth of 25 feet below grade taking split spoon samples at five-foot intervals with a standard, 24-inch long, 1-3/8 inch I.D. (2.0 inch O.D.) stainless steel split spoon sampler. Upon completion, the soil borings were filled with a neat cement grout (three percent bentonite-by-weight) mixture pumped into each borehole through a tremie pipe set at the bottom to the surface. Drill cuttings were spread over the ground thinly around each soil boring location.

All soil samples collected for chemical analysis were obtained using properly decontaminated, stainless steel, split spoon samplers as described in the approved Medley Farm Site POP (Appendix A). The first boring (SB1) was drilled in a background location where samples were collected at 5, 15, and 25 feet. Four borings were drilled through suspected former lagoon areas (SB2, SB3, SB4 and SB9). These four borings were sampled at 10, 15, and 25 feet, and soil samples were analyzed for the approved indicator parameters, TCL volatile and semi-volatile organic compounds (SVOCs). Five additional borings (SB5, SB6, SB7, SB8, SB10) were drilled in probable drum storage areas identified by inspection of aerial photographs, review of the soil gas survey, and test pit soils analyses and observations. These five borings were sampled at 5, 15, and 25 feet, and samples were also analyzed for the approved indicator parameter compounds.

Although existing data does not indicate that wastes containing dioxins were stored or disposed of at the Medley Farm Site, samples were collected and analyzed to screen for the potential presence of dioxins as required by EPA.

One composite sample was analyzed from soil samples collected from borings SB2 and SB5 (three to five feet and two to four feet, respectively) for dioxins and related compounds.

3 10 0157

All soil samples were identified in the field by a Sirmine hydrogeologist using visual/manual techniques described in ASTM D-2487 and D-2488 and in accordance with the Unified Soil Classification System. The Test Boring Reports are presented in Appendix D.

Portions of each split spoon sample were also collected for physical soil analyses. The results of physical soils analysis provided further information for overall Site soil characterization and provided data for estimation of hydraulic conductivities.

3.6 FRACTURE TRACE ANALYSIS

3.6.1 Objectives

Aerial photographs (Bell Mapping Company, 1988) and the U.S. Geological Survey 7.5 minute topographic quadrangle map of the Site (Pacolet Mills, 1969) were examined to identify linear features which may be surface expressions of vertical or nearly vertical fractures in the underlying bedrock. Identification of potential fracture traces provides valuable data for the interpretation of probable ground-water flow paths in fractured bedrock and therefore potential pathways for contaminant migration.

This information was considered during the selection of monitoring well locations during Phase I and Phase II of the RI.

3.6.2 Fracture Trace Identification and Evaluation

NUS made several observations regarding fracture trace/lineament identification at the Medley Farm Site in their 1983 Geophysical Study. NUS concluded that two sets of fracture traces/lineaments were dominant in the area. The orientation of the dominant fracture trace

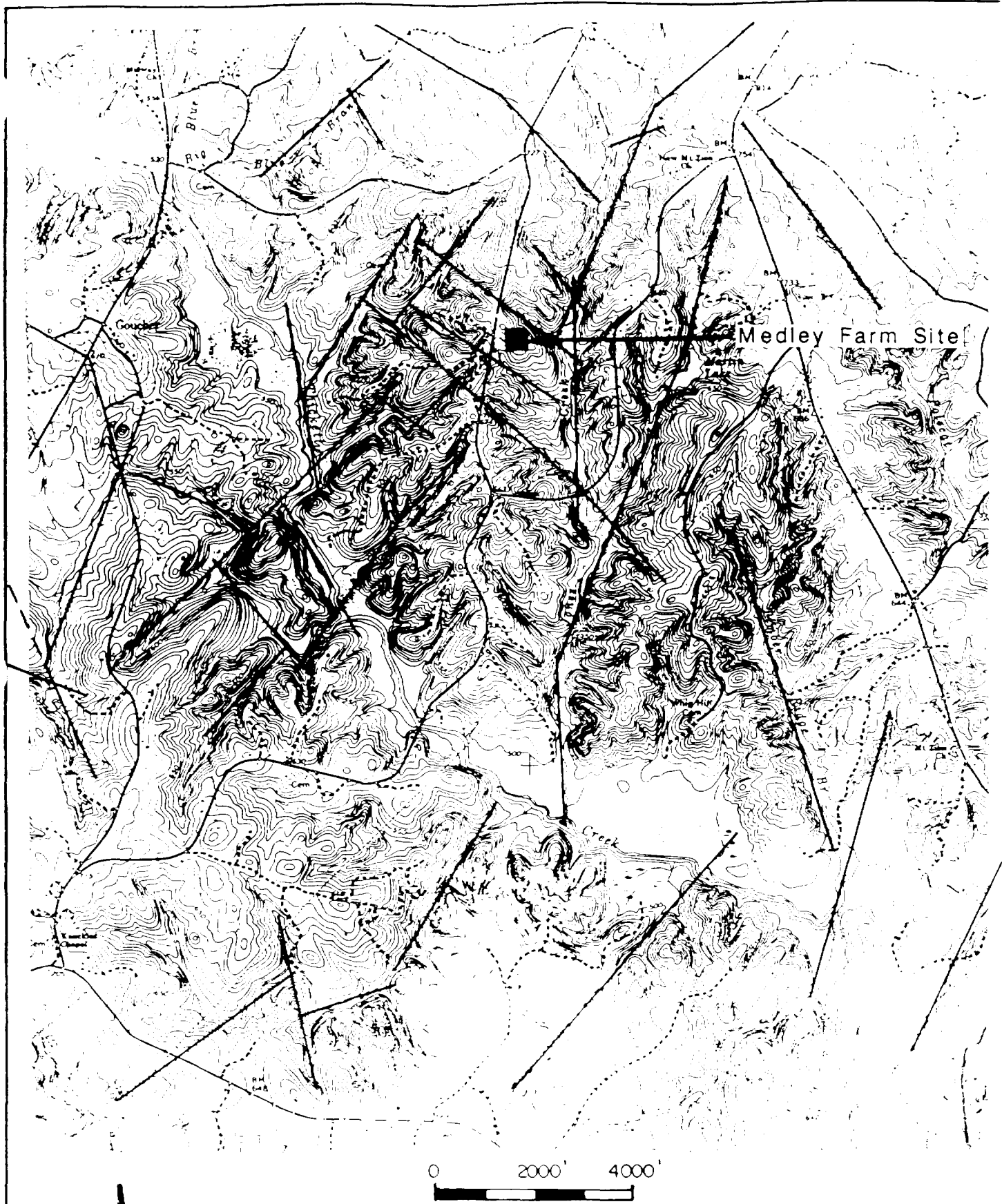
set was to the north-northeast. The secondary set of linear features trend to the north-northwest. As part of the RI, the NUS study was reviewed and additional fracture trace analysis conducted.

The fracture trace analysis conducted for this RI effort substantiated the NUS study's findings. The predominant sets of linear features are readily recognizable (Figure 3.4). The dominant orientation of lineaments present in the vicinity of the Site is to the north-northeast with a subordinate set oriented to the north-northwest. The dominant set of linear features are more numerous and typically of greater length than the subordinate set.

After confirming local lineament trends on the U.S.G.S. topographic quadrangle map, potential fracture traces were identified and drawn onto the Site map produced photogrammetrically for this project (Bell Mapping, 1988). This information was considered in the selection of rock monitoring well locations.

3.6.3 Aerial Photograph Review

During May, 1989, two low angle oblique color aerial photos of the Medley Farm Site were obtained from the SCDHEC Ground Water Protection Division in Columbia, South Carolina. These photos were reportedly taken by EPA a short time prior to the EPA source removal action in 1983. Six lagoon sites were identified on those photos, however, locations could not be accurately determined due to the oblique nature of the aerial photos and lack of scale. Primary areas of drum storage were also identified on the EPA aerial photos. These photos were compared to the map included in the NUS report of geophysical investigations of the Site (Figure 2.5), and the results of the PETREX® soil gas survey performed during this RI. Good correlation of primary source areas was observed. This data was used to select the locations of test pits and soil borings performed during Phase IB of the RI.



Greenville, South Carolina

Figure 3.4
Medley Farm Site RI
Fracture Trace Analysis

In addition to the EPA photos, one high altitude black and white aerial photo, taken in 1976, was obtained from the Cherokee County assessor's office. One lagoon was identified on the 1:400 scale aerial photo obtained from the assessor's office and accurately located on the topographic base map used to locate subsurface explorations during the RI. Test pit TP3 and soil boring SB3 provide confirmation and chemical sampling at that location.

3.7 MONITORING WELLS

A total of 21 ground-water monitoring wells and two water level piezometers were installed during the RI.

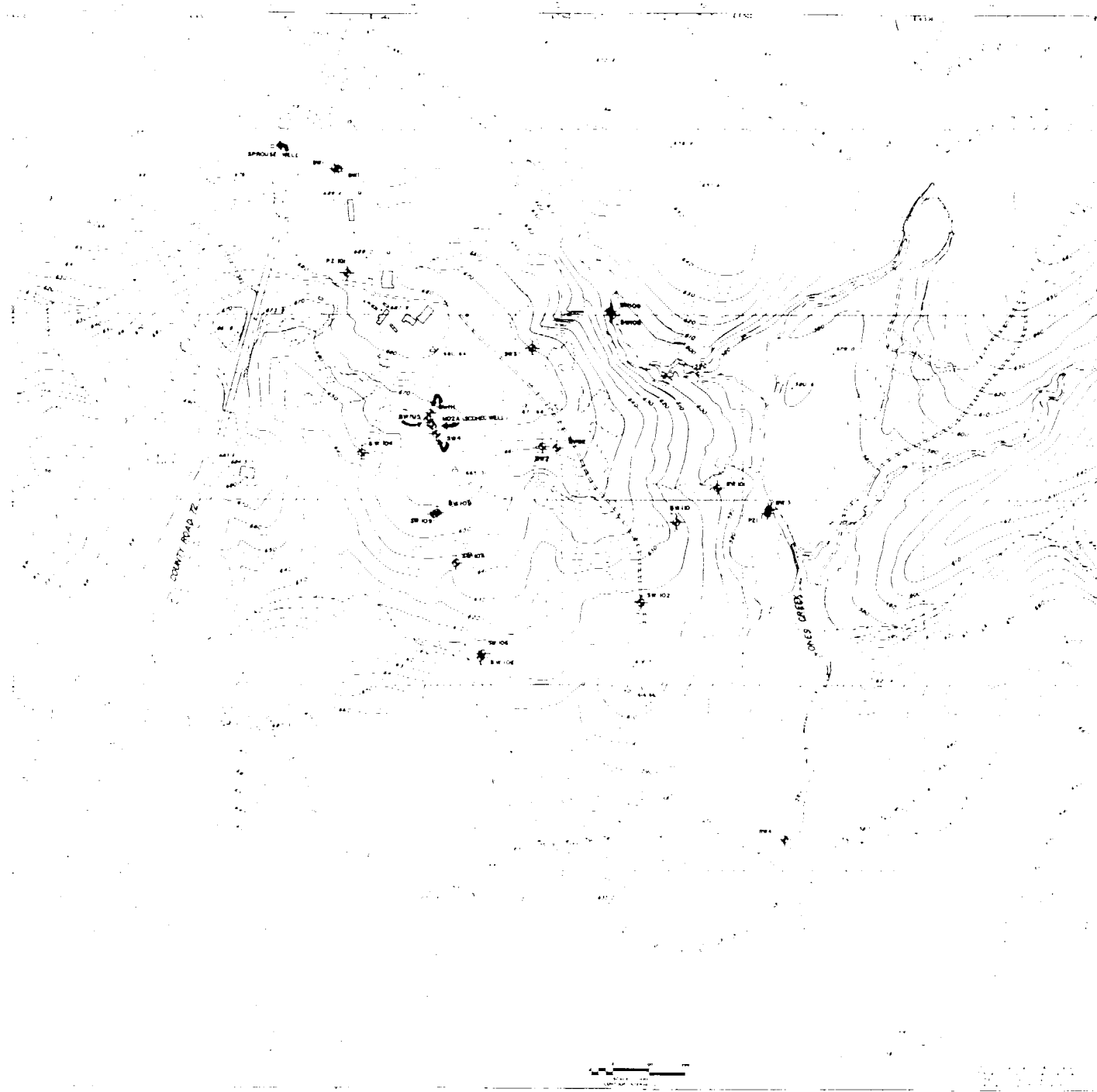
The locations of all monitoring wells and piezometers installed at the Medley Farm Site are shown on Figure 3.5. The prefix of each well number identifies the aquifer media screened or type of installation (SW denotes monitoring well screened in soil; BW denotes monitoring well constructed in bedrock; PZ denotes standpipe piezometer constructed for water level measurement only). Surveyed coordinates of all monitoring well locations are included in Appendix E along with detailed installation diagrams. Well construction data is summarized on Table 3.2. Records of indicator parameters and field observations made during well development are presented in Appendix F.

3.7.1 Objectives and Rationale

Four bedrock wells (BW1, BW2, BW3 and BW4), three saprolite wells (SW1, SW3, SW4), and one water level piezometer (PZ1) were installed during Phase I of the RI. Monitoring wells were installed during Phase I to:

- provide general characterization of the hydrogeology at the Site
- investigate the potential presence and nature of any residual chemicals which may have impacted ground water.

1

[illegible]

Survey of the impact of Group 1
WGA on the economy of the
United Kingdom

GROUND WATER MONITORING was established from May to August 1989. Environmental Consulting and Services Inc. of Anderson, S.C. and August to October 1989 by Aquatic Testing and Engineering of Alaska, G.A. Surveying was completed by Service Environmental Consultants of Colorado.



SIRRI
SOCIETÀ ITALIANA
RISERCHES INDUSTRIALI

Figure 1.

Abstract—The purpose of this study was to determine if there were differences in the prevalence of musculoskeletal disorders among different types of jobs. The subjects were 600 employees from a large manufacturing company who had been employed at least one year. A questionnaire was sent to each employee asking about his or her job characteristics, symptoms of musculoskeletal disorders, and demographic information. The results showed that the prevalence of musculoskeletal disorders was higher among workers in jobs that required heavy lifting, repetitive motions, and awkward postures than among workers in jobs that did not require these activities. The results also showed that the prevalence of musculoskeletal disorders was higher among workers in jobs that required long hours of work than among workers in jobs that did not require long hours of work.

Figure 3.5

TABLE 3.2
MEDLEY FARM SITE RI
MONITORING WELL CONSTRUCTION DATA

Well No. (1)	Date Installed	Total Depth (2) (ft.)	Well Casing Diameter (In.)	Top of Well Casing (3) (ft.)	Top of Screen or Top of Open Corehole (3) (ft.)	Bottom of Screen or Bottom of Open Corehole (3) (ft.)	Length of Sampling Interval (ft.)
BW1	6/8/89	94.8	4.0	689.90	603.05	593.85	9.20
BW2	7/24/89	85.0	2.0 (4)	662.99	596.90	576.26	20.64
BW3	7/18/89	55.0	4.0	574.82	537.94	518.44	19.50
BW4	7/14/89	31.0	4.0	564.32	544.65	531.65	13.00
BW105	10/3/90	112.9	2.0	671.55	578.77	558.57	20.20
BW106	9/20/90	80.8	4.0	595.76	533.74	511.91	21.83
BW108	9/6/90	93.9	4.0	605.64	529.35	509.25	20.10
BW109	9/27/90	90.0	4.0	661.47	590.65	569.15	21.50
BW110	9/27/90	84.5	4.0	626.36	561.13	540.73	20.40
BW111	10/3/90	248.4	4.0	672.41	479.37	420.97	58.40
BW112	10/8/90	239.0	4.0	664.08	482.84	422.84	60.00
SW1	6/13/89	65.0	2.0	690.47	644.46	629.26	15.20
SW3	6/23/89	79.0	2.0	671.56	608.11	592.90	15.21
SW4	7/12/89	70.5	2.0	671.39	615.58	600.38	15.20
SW101	8/28/90	34.3	2.0	604.18	577.30	567.30	10.00
SW102	8/23/90	50.0	2.0	620.07	583.85	568.85	15.00
SW103	8/16/90	49.7	2.0	635.68	603.68	588.40	15.28

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TABLE 3.2
MEDLEY FARM SITE RI
MONITORING WELL CONSTRUCTION DATA (CONTINUED)

Well No. (1)	Date Installed	Total Depth (2) (ft.)	Well Casing Diameter (In.)	Top of Well Casing (3) (ft.)	Top of Screen or Top of Open Corehole (3) (ft.)	Bottom of Screen or Bottom of Open Corehole (3) (ft.)	Length of Sampling Interval (ft.)
SW104	8/20/90	39.5	2.0	649.85	627.66	612.46	15.20
SW106	8/29/90	24.0	2.0	596.12	587.09	571.91	15.18
SW108	8/30/90	20.0	2.0	605.28	596.72	583.66	15.06
SW109	9/14/90	64.2	2.0	661.26	613.85	598.65	15.20
PZ1	7/24/89	15.0	2.0	575.41	570.41	560.30	10.11
PZ101	8/16/90	61.0	1.0	688.49	641.94	627.04	14.90

Notes:

- 1) Well number indicates type of monitoring well; SW = Saprolite Well; BW = Bedrock Well; PZ = Piezometer.
- 2) Total depth is measured from the top of the well casing to the bottom of the screen or corehole.
- 3) Elevation in feet above mean sea level.
- 4) Due to instability of rock in the corehole a 2.0 inch well was placed inside the corehole and 4.0 inch casing. Stainless steel screen and riser pipe were used to above the water table with PVC riser to the surface. No sandpack, bentonite, or grout was placed around the 2.0 inch well. The well was sealed at the surface with a safety seal between the 2.0 inch and 4.0 inch casing.

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The approved Work Plan included the installation of eight ground-water monitoring wells during Phase I of the RI. These wells were proposed to be installed in four pairs consisting of a water table (saprolite) well and a deeper, bedrock well at each location. Well pairs were to investigate the vertical extent of any chemicals detected in the ground water. Based upon comments from SCDHEC and subsequent conversations with EPA, the monitoring well locations were modified. Well pairs proposed adjacent to Jones Creek were replaced by single bedrock wells at those locations (BW3 and BW4). Saprolite well locations were added immediately northeast (SW3) and southwest (SW4) of the former disposal area. A well pair was installed at the approved background well location (SW1 and BW1) as originally proposed. Although the final approved Phase I monitoring well scheme included a saprolite/bedrock well pair immediately southeast of the former disposal area, a bedrock water table well (BW2) only was installed at that location since ground water was not encountered there in the saprolite. Therefore, the proposed saprolite well (SW2) was not installed at the site. A piezometer (PZ1) was installed adjacent to BW3 to evaluate potential head differences between the ground water occurring in the bedrock and unconsolidated sediments. This piezometer was added based upon field observations during the Phase I field work to help evaluate potential discharge to Jones Creek.

Fourteen additional monitoring wells and one additional piezometer were installed during the Phase II RI field effort. Seven of these monitoring wells were installed at the water table in saprolite (Saprolite wells - SW) and seven were constructed in bedrock (Bedrock wells - BW). These wells are identified by the 100 series numbers as shown on Figure 3.5. Four of the saprolite wells installed during Phase II were installed in place of the hydropunch sampling and temporary piezometer installations described in the Phase II Work Plan, due to the density of the aquifer media which prohibited the use of the hydropunch (SW101 through SW104).

The objectives of additional monitoring wells installation during Phase II were to:

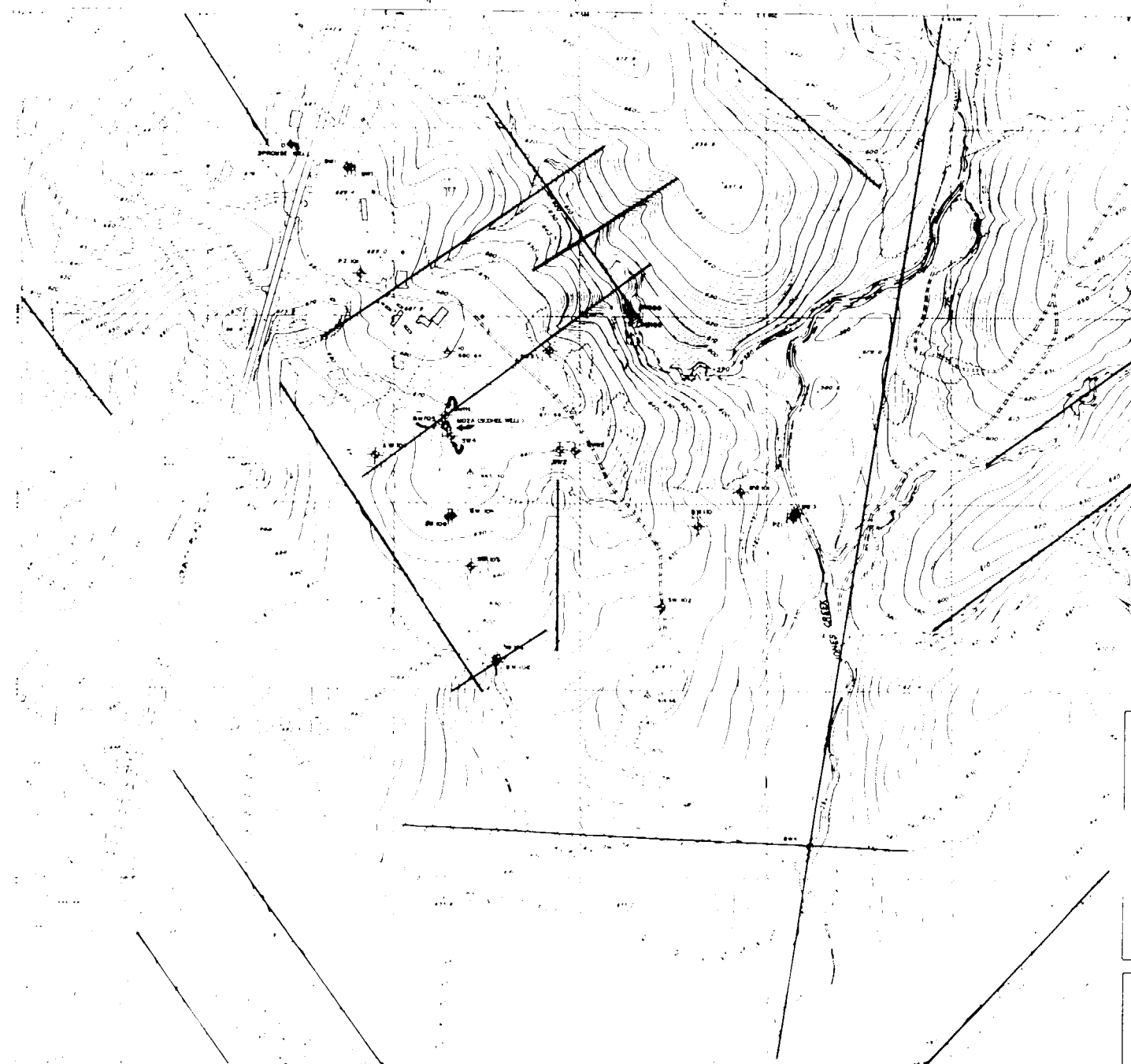
- Determine the hydraulic relationships between ground water occurring in the bedrock and saprolite at the Site and adjacent surface water features;
- Complete the characterization of the horizontal and vertical extent and concentrations of contaminants in the ground water beneath the Site;
- Establish ground-water flow patterns;
- Confirm that the nearby domestic water supply well (the Sprouse well) has not been impacted by former disposal activities at the Site;
- Provide additional characterization of background levels of inorganic constituents in ground water to confirm that inorganics are not associated with former Site disposal activities;
- Define ground-water discharge areas.

Figure 3.6 illustrates predominant lineaments identified in the immediate vicinity of the Site in relation to the locations of monitoring wells installed during the RI.

The rationale for the selection of each monitoring well location and screened depths is presented below:

- SW1, BW1; This well pair is approximately 400 feet northwest of the former disposal area of the Medley Farm Site, hydrogeologically upgradient. This well pair was placed between the Site and the Sprouse domestic well to confirm that contaminants detected in ground-water samples collected and analyzed by SCDHEC in 1984 from this well were not the result of Site activities.

1



- INTERMEDIATE CUMULUS
CENTRAL CUMULUS
NEAR CUMULUM
INTERMEDIATE CUMULUS
CENTRAL CUMULUS
NEAR CUMULUM
WATER
UNIMODAL WAVE
UNIMODAL
BIMODAL
LOCATED UNDER
FENCE
PILE
THREE
BROWN

Surveyed location of original
Wald, Marking Wall in
Place number

GROUND WATER MONITORING wells were installed from May to August 1988 by Environmental Monitoring and Research Inc. at Anderson S.S. and August to October 1989 by Atlanta Testing and Engineering of Atlanta, GA.

The study was conducted by Strimling and Associates of Tampa, Florida. The investigation of Tampa, Florida at Charleston, FL

FIGURE 3.6
MONITORING WELL
LOCATIONS AND
SITE LINEAMENTS

Modley, Farm, etc.
Gaffney, South Carolina
Remedial Investigation
Emergency Utility



- BW2; This well is situated within the southeast boundary of the former disposal area. This location was selected to enable sampling of ground water immediately downgradient of former disposal and drum storage areas.
- SW3; This saprolite well location is approximately 150 feet northeast of a former lagoon location confirmed on a 1976 aerial photo of the Site, and less than 100 feet from suspected drum storage areas. This location is also at the head of a major draw which may have developed in response to an underlying fracture system in the parent bedrock. This well was screened at the water table in the saprolite to detect any potential contaminants which may have migrated northeasterly from the Site.
- SW4; This water table well location is approximately 100 to 200 feet from a suspected lagoon location to the northeast and directly south of suspected lagoon and drum storage locations to the north. This location is also approximately 25 feet due south of the existing well installed by SCDHEC. This location was selected to detect any potential ground water contamination which may have migrated south and southwest from former lagoon and drum storage areas.
- BW3 and BW4; These locations were selected to be downgradient from former Site operations, along probable fracture traces which would constitute the most likely pathways for contaminant migration from the Site. The regional strike of the metasedimentary rocks present beneath the Site is to the northeast and regional dip is to the southeast (Overstreet and Bell, 1965). The proposed bedrock well locations at BW3 and BW4 were selected, according to this data in order to be geologically downdip from the former disposal area. Both locations are immediately adjacent to Jones Creek which follows the most prominent regional lineament trend, northeast-southwest. This trend is locally manifested by erosional features 1/3 mile or greater in length. Two prominent intermittent drainage gullies located immediately northeast and southwest of the

Medley Farm Site follow a less prominent northwest-southeast lineament trend. The orientations and locations of these drainage features have likely developed in response to prominent fractures present in the underlying bedrock. BW3 was located approximately 200 to 300 feet south of the confluence of the intermittent drainage gully located northeast of the Site to screen for any contaminants which may have migrated along fractures beneath this gully and/or directly southeast to Jones Creek. BW4 was located at the confluence of the intermittent drainage gully located southwest of the Site to screen for any contaminants which may have migrated along this gully toward Jones Creek, or directly south along Jones Creek after migrating southeasterly to fractures associated with Jones Creek.

- PZ1; This piezometer was installed in response to field observations at the water table immediately adjacent to BW3 to evaluate potential head differences between ground water in the bedrock and the overlying unconsolidated sediments at this location.
- SW101 and BW110; These locations are hydraulically downgradient of BW2, between bedrock wells BW2 and BW3. No contaminants were detected in Phase I analyses at BW3 although 1.795 mg/l (Phase IA) and 1.418 mg/l (Phase IB) of total volatile organics were detected in samples analyzed from BW2. Ground-water was not present in the saprolite at the BW2 location. The SW101 and BW110 locations were selected to evaluate the location of the leading edge of the ground-water contaminants in the saprolite and bedrock in this area.
- SW102; This location was selected to provide characterization of contaminant concentrations halfway between BW2 and BW4, thereby providing additional data to define the leading edge of contaminant migration. The selection of this location was based on Phase I modeling efforts.

- SW103; This location was selected to enable the evaluation of any potential southerly component of ground-water flow from the former disposal area and to determine whether contaminants may have migrated directly south from the former disposal site.
- SW104; This location was selected to enable the evaluation of any potential southwesterly component of ground-water flow or any contaminant migration from the former disposal area.
- BW105 and BW111; These wells are deep bedrock wells installed to evaluate the extent of vertical migration of contaminants in ground water in the fractured bedrock. This location was selected adjacent to SW4 where the highest levels of volatile organic compounds detected in ground-water were found during the Phase I RI.
- SW106/BW106; A saprolite/bedrock well pair was installed at this location to evaluate the potential migration of contaminants in ground water along the prominent ravines which intersect here and may represent fracture systems in the subsurface. These wells also provide valuable ground-water level data to evaluate southerly flow components from the Site.
- BW112; This deep bedrock well was added to the Phase II RI scope after drilling and sampling BW105, to provide additional assessment of the extent of contaminants present in ground water at depth in the fractured bedrock.

- PZ101; This standpipe piezometer was installed in saprolite at the water table to confirm that the Sprouse domestic well (location included on Figure 3.5) is located upgradient of the Medley Farm Site, and therefore is not impacted by contaminants from the Site.

3.7.2 Drilling and Construction Details for Saprolite Monitoring Wells

Saprolite wells were generally installed through 6-inch I.D. hollow stem augers as described in the P.O.P. and excerpts included as Appendix A. At selected locations during Phase II, monitoring wells (SW101, SW103, SW104, SW109) were installed in open boreholes drilled with 3 1/4-inch I.D. (8-inch O.D.) augers after refusal was encountered with the larger diameter augers before reaching saturated conditions and it was determined that borehole stability was not a problem at the Site.

Soil samples were collected from borings drilled for monitoring well installation and described for general Site characterization as specified in the P.O.P. The logs of all borings drilled for monitoring well installation are presented in Appendix D.

Saprolite monitoring wells were constructed in accordance with specifications presented in the P.O.P. (See Appendix A) except at one well location (SW101) where only 10 feet of stainless steel screen was used due to the minimal saturated thickness encountered in the saprolite at that location. The sand pack design was altered during Phase II based upon the evaluation of soil grain size analyses in an effort to minimize the turbidity of ground water samples collected from wells screened in saprolite. A finer grained silica sand (Foster-Dixiana BX-30) was used at monitoring wells SW101, SW106 and SW109. Foster-Dixiana FX-50 was used for all other saprolite well installations. Grain-size distribution data supplied by the manufacturer for these materials is included at the back of Appendix E.

Ground-Water Monitoring Well Installation Details and a summary of the survey data for all saprolite wells are presented in Appendix E.

3.7.3 Drilling and Construction Details for Bedrock Monitoring Wells

All drilling and installation of bedrock monitoring wells was accomplished in accordance with the P.O.P except as described below. At locations where physical soil characterization had been accomplished in an adjacent test boring, the bedrock borehole was advanced from ground surface to bedrock with a 10-inch tri-cone roller bit without the collection of additional soil samples. Water used for drilling, rock coring, and decontamination was obtained from a public fire hydrant approximately one mile from the Medley Farm site. The water lines and hydrant are part of the Draytonville Municipal Water System.

The approved P.O.P specified open bedrock coreholes extending approximately 20 feet below the bottom of the 4.0-inch I.D. permanent stainless steel casing. This was not possible at wells BW1 and BW4 due to lost circulation and corehole instability. The cored open-hole sections of these wells are 9.2 and 13.0 feet in length, respectively.

After BW2 was cored, pressure tested, and the rock evaluated, a 2.0-inch I.D. stainless steel screen and casing was installed inside the open corehole and 4.0-inch outer casing due to concern for the long term stability of the corehole. Stainless steel screen and riser pipe (2.0-inch) were installed to approximately 10 feet above the water table and PVC riser pipe was extended to the surface. A sanitary seal was installed around the 2.0-inch PVC riser at the surface inside 4.0-inch PVC riser to secure the inner pipe. No sand pack or seals were installed in the annular space between the 2 and 4 inch casings or in the open cored section.

At BW105, the bedrock was cored 50 feet for visual assessment of fracturing in the bedrock and to allow for discrete interval sampling in the deep bedrock to investigate the potential vertical extent of contamination. After reviewing the analytical results and observing a decrease in contaminant concentrations with depth a decision was made to grout the lower 25 feet of the corehole. After allowing a minimum of 24 hours for the grout to cure, a two foot thick bentonite pellet seal was placed above the grout. A 2.0-inch stainless steel screen and riser pipe were installed inside the corehole and the 4.0-inch outer casing to

approximately 10 feet above the water table, and PVC riser pipe was extended to the surface. A sand pack consisting of Foster-Dixiana FX-50 washed silica sand was installed through a tremie pipe around the screen to seven feet above the top of the screen. A two foot thick bentonite pellet seal was constructed above the sand pack and allowed to hydrate according to procedures outlined in the P.O.P. The remaining completion was accomplished as outlined in the P.O.P.

Rock core recovered was logged by a Sirmine hydrogeologist. Detailed test boring and core boring logs are presented in Appendix D. Photographs of all rock core samples are provided in Appendix K for additional documentation of bedrock conditions. The Ground-Water Monitoring Well Installation Details for the bedrock wells, including a summary of the survey data are also presented in Appendix E.

3.7.4 Well Development

Well development was conducted between two and four weeks after each well was installed. The saprolite wells were developed by manually pumping and surging with a Brainard-Kilman PVC hand pump. The bedrock monitoring wells were developed using a Grundfos stainless steel submersible pump. During well development, the ground-water temperature, pH, and specific conductance were monitored as indicator parameters. The turbidity was also monitored visually during the development process and a subjective evaluation of changes in turbidity was recorded on the development logs. A turbidimeter was used during Phase II to provide a quantitative record of changes in turbidity during well development. These measurements are also included on the well development logs. Well development continued until the ground-water indicator parameters had stabilized or, at a minimum, a volume of water equal to that introduced during drilling was removed from the well. Development water was pumped into pits excavated adjacent to each well to allow for slow infiltration back into the ground.

These pits were backfilled prior to demobilization from the Site. Well development logs are included in Appendix F.

3.8 IN-SITU HYDRAULIC CONDUCTIVITY TESTING

3.8.1 Objectives

Slug tests (falling and rising head permeability tests), and water pressure tests were performed to evaluate the hydraulic characteristics of the saprolite and bedrock aquifers beneath the Site. An aquifer test was not performed during the RI. Sufficient data was obtained from the slug tests and water pressure tests to evaluate the feasibility of ground water extraction at this Site.

3.8.2 Water Pressure Testing

Water pressure tests were conducted on the cored sections of BW2, BW3, and BW4 during Phase I and BW106, BW108, BW109, BW110, BW111, and BW112 during Phase II to investigate the effective permeability (hydraulic conductivity) of the rock mass at each bedrock well location. Water pressure testing was not performed at BW105 due to logistical considerations late in the project schedule. The water pressure tests were conducted in accordance with the general procedures outlined in the U.S. Bureau of Reclamation's Earth Manual, (1974). A single packer was expanded pneumatically at the top of the corehole to isolate the cored test section. Clear tap water was then pumped under pressure into the test section and flow quantity versus elapsed time was measured. The total volume of water pumped into the rock was recorded during each test. An equivalent volume or greater volume was removed during subsequent purging and development. Water pressure test results were interpreted by methods discussed in A. Houlby's "Routine Interpretation of the Lugeon Water Test" (1976).

Bedrock well BW1 was not pressure-tested. Approximately 700 gallons of water was lost while attempting to circulate water for coring. Due to the rapid loss of water observed while coring, it was determined that a water pressure test would not provide additional information at this location.

The Water Pressure Test Data Reduction sheets and the Field Water Pressure Test result forms are included in Appendix H. Hydraulic conductivity values obtained from water pressure tests in the bedrock range from 7.09×10^{-5} to 4.13×10^{-4} cm/sec except in the deep bedrock wells (BW111 and BW112) which yielded hydraulic conductivities of 8.49×10^{-7} and 7.82×10^{-7} cm/sec respectively.

3.8.3 Slug Testing

In-situ falling and/or rising head permeability tests (slug tests) were performed in wells installed during Phase I and Phase II of the RI. These tests were conducted in January, 1990 for the Phase I wells and in October, 1990 for the Phase II wells. All slug tests were performed and analyzed using the techniques described by Bouwer and Rice (1976) and Bouwer (1989).

Slug tests were performed in all saprolite and bedrock wells installed during Phase I. During Phase II, a slug test was not performed in saprolite well SW101 due to insufficient thickness of the water column in that well (3.94 feet). In addition, slug tests were not performed in bedrock wells installed during Phase II since water pressure test measurements are considered more representative of in-situ rock mass hydraulic conductivity (permeability) due to the larger radius of influence.

Rising head tests only were performed in wells screened across the water table to avoid the effects of flow into the unsaturated materials above the test zone. For these tests, a closed cylinder of known volume was lowered into the well after the pressure transducer was installed and the static water level had been recorded. Once the water level returned to static or equilibrium conditions, the cylinder was rapidly removed from the well, simulating

the removal of a "slug" of water. The recovery of water in the well was then monitored and recorded using a pressure transducer and a Hermit environmental data logger (Model SE 1000B).

Where water levels extended above the top of the screened or open core hole test zone, both falling head and rising head tests were performed on the wells installed during Phase I to provide additional confirmation of the rising head test data and water pressure test results. Based on these results, rising head tests only were performed in saprolite wells during Phase II.

Falling head tests are performed in the same general manner as the rising head tests. The difference is that water levels are also monitored as they "fall" back to static or equilibrium conditions after introduction of the slug. When the falling head test segment was completed at each location, the rising head test was performed.

The data recorded by the Hermit data logger was later downloaded into a computer where it could be manipulated into a usable format. The data was used to generate semi-logarithmic plots of recovery versus time. Hydraulic conductivity values were calculated using the following equation (Bouwer and Rice, 1976 and Bouwer, 1989):

$$K = \frac{(r'_c)^2 \ln(R_e/r_w)}{2L_e} \times \frac{1}{t} \times \ln(y_o/y_i)$$

where:

- r'_c = radius of inside well casing (corrected for unsaturated gravel pack response as shown in Bouwer, 1989)
- r_w = radial distance between well center and undisturbed aquifer (r_c plus thickness of gravel envelope or developed zone outside casing, plus casing thickness)

L_e	=	length of perforated, screened, uncased, or otherwise open section of well through which ground water enters
L_w	=	depth from water table to bottom of screened interval
y_o	=	hydraulic head at time zero
y_t	=	hydraulic head at time t
t	=	time since y_o
R_e	=	effective radial distance over which the head difference, y , is dissipated
K	=	hydraulic conductivity
$\ln(R_e/r_w)$	=	dimensionless ratio used to evaluate R_e for various system geometries (See Bouwer and Rice, 1976)

Calculation sheets and semi-logarithmic plots of time versus recovery are included in Appendix F. Hydraulic conductivity values in the saprolite range from 3.8×10^{-5} to 7.79×10^{-4} cm/sec. These values appear reasonable based on the observed nature of the soil and values of 10^{-5} to 10^{-1} reported in references (Freeze and Cherry, 1979).

3.9 GROUND-WATER SAMPLING

3.9.1 Objectives

One set of ground-water samples were collected from two saprolite (SW3 and SW4) and two bedrock (BW2 and BW4) monitoring wells during Phase IA. Samples from these locations were analyzed for the complete list of TCL and TAL parameters due to their close proximity to the former disposal area (SW3, SW4, BW2) and to assist in defining the Site specific list of indicator parameters to be used in subsequent sampling efforts. BW4 was selected for complete TCL/TAL parameters to provide additional information regarding ground-water conditions at the furthest downgradient monitoring well location.

In Phase IB, all the wells installed during Phase I were sampled (three saprolite wells: SW1, SW3 and SW4; and four bedrock wells: BW1, BW2, BW3 and BW4). The samples collected during Phase IB were analyzed for the indicator parameter list determined after evaluating Phase IA analytical results. Phase II sampling and analysis included a complete round of sampling of all monitoring wells installed during Phase I and Phase II. The samples collected during Phase II were analyzed for the indicator parameter list determined from Phase IA analytical results.

All ground-water samples were collected and preserved as described in the P.O.P. in accordance with EPA protocols. All equipment used for well purging and sampling was decontaminated in accordance with the approved procedures. The ground-water analyses were evaluated to assess potential impacts to ground water at the Site.

3.9.2 Phase IA

During Phase IA, two saprolite (SW3 and SW4) and two bedrock (BW2 and BW4) monitoring wells were sampled on August 8 and 9, 1989. Teflon bailers were used to purge the required volumes of water from each well prior to sampling except at BW2. At BW2, an ISCO bladder pump was used due to the large volume of water to be removed. When purging was completed, all wells were sampled using Teflon bailers. The same bailer used for purging was used at each well for sampling. These samples were analyzed for the complete list of TCL and TAL parameters.

Field measurements and observations made while sampling were recorded on Field Data Information Logs for Ground-Water Sampling and are included in Appendix I. Monitoring well locations are shown in Figure 3.2.

3.9.3 Phase IB

During Phase IB, all of the seven monitoring wells installed during Phase IA were sampled. Phase IB ground-water sampling was performed on January 9, 10, and 11, 1990. This sampling effort included three saprolite wells (SW1, SW3, SW4) and four bedrock wells (BW1, BW2, BW3, BW4). Wells SW1, SW3, SW4 and BW4 were purged and sampled using Teflon bailers. Wells BW1, BW2 and BW3 were purged using a ISCO bladder pump and sampled with Teflon bailers. The samples were analyzed for the approved indicator parameters defined during Phase IA. The Phase IB Field Data Information Logs for Ground-Water Sampling Phase IB are also included in Appendix I.

3.9.4 Phase II

During Phase II the ground-water sampling was performed from August 29 thru October 16, 1990. Four new saprolite monitoring wells (SW101, SW102, SW103, SW104) were installed and sampled in lieu of Hydropunch™ sampling due to the density of the saprolite. These preliminary samples (SW101-1, SW102-1, SW103-1, and SW104-1) were collected from these wells and submitted for TCL-volatile organic analysis on a quick-turnaround basis (24 to 72 hours) using routine laboratory QA/QC (Non-CLP). The results of these preliminary analyses were used to determine final monitoring well locations in accordance with the rationale presented in the approved Phase II Work Plan. Preliminary samples were also collected from (SW106/BW106) and submitted for TCL-volatile organics on a quick-turnaround basis. These samples were analyzed in accordance with full CLP protocols. The results of these preliminary analyses were used to determine final monitoring well locations in accordance with the rationale presented on Figure 4.1 of the approved Phase II Work Plan. The rationale presented in the Phase II Work Plan involved consideration of the absence or presence of contaminants in these preliminary analytical results to determine the final locations and number of monitoring wells installed during Phase II. A discussion of the rationale for the location of each monitoring well installed at the site is presented in Section 3.7.1.

The analytical data for samples analyzed on a quick-turnaround basis is included in Appendix L, in the subsection labeled Ground Water (Phase II). The results of non-CLP analyses are summarized on a separate, one page table which is presented at the beginning of this subsection.

Samples were collected from three discrete intervals within the open corehole at the new BW105 monitoring well location. These samples were collected by using a stainless steel and teflon bladder pump isolated by a double pneumatic packer assembly to sample from discrete fracture zones identified in the bedrock. These samples were submitted for TCL-volatile organic analyses on a quick-turnaround basis (24 hr.) using routine laboratory QA/QC (Non-CLP). The results of discrete interval sampling and analysis was used to evaluate the vertical distribution of contaminants at that location. Based upon the results of these chemical analyses from BW105, two additional deep wells (BW111 and BW112) were added to the RI scope after consultation and approval from the Superfund RPM to provide further evaluation of the potential vertical extent of contaminant migration.

A complete round of ground-water samples from all the Phase I and Phase II monitoring wells was collected at the completion of the Phase II field work. This included ten saprolite wells and nine bedrock wells. Ground water samples could not be collected from the two deep bedrock wells BW111 and BW112 since no water bearing fractures were encountered at those locations. All ground-water samples collected during this complete round of sampling were all subjected to TCL- volatile organic analyses using strict laboratory QA/QC (CLP). Samples were collected with a teflon bailer or bladder pump depending upon volume to be purged prior to sampling. Sampling equipment is identified on the Phase II Field Data Information Logs for Ground-Water Sampling included in Appendix I. All monitoring well locations are shown on Figure 3.2.

3.10 SURFACE WATER AND STREAM SEDIMENT SAMPLING

3.10.1 Objectives

Surface water and stream sediment samples were collected from Jones Creek to evaluate the potential presence of contaminants in these media and to compare the quality of surface water and bottom sediments immediately upstream and downstream from the Site. Due to the fact that Jones Creek is located approximately 500 to 1000 feet downgradient of the former disposal area and is the only perennial surface water feature in proximity to the Site, surface water and stream sediment sampling was confined to Jones Creek. Sampling of Thicketty Creek or other tributaries distant from the Site would not provide conclusive data concerning potential impacts from former Site disposal activities due to their distance from the Site and the potential of impact from other, unknown, off-site sources. All surface water and stream sediment sampling activities were conducted in Phase IB.

3.10.2 Phase IB Sampling

Surface water and stream sediment samples were collected on January 11, 1990. Samples were collected from the downstream (RW4/SS4) location first to avoid any potential impact from collecting the upstream samples (RW1/SSI). A total of four locations were sampled. The surface water sample was collected prior to the collection of the stream sediment sample at each location to avoid suspended sediments in the water samples. All samples were collected in accordance with the approved POP. Surface water and sediment samples were analyzed for TCL volatile and semi-volatile organic compounds following full CLP protocol. The surface water and stream sediment sampling locations are shown on Figure 3.4.

3.11 STREAM GAUGING

3.11.1 Objectives

Ground-water discharge from the Site to Jones Creek was evaluated using surface water level and flow measurements obtained from stream gauging stations and staff gauges in conjunction with ground-water level measurements made at the same time in monitoring wells installed in close proximity to the creek. The data were compared to evaluate head differences which would induce ground-water flow into Jones Creek.

3.11.2 Station Construction and Monitoring

Stream gauging stations were constructed during Phase I of the RI at two locations on Jones Creek located upgradient and downgradient (SGS-1 and SGS-2, respectfully) from the Medley Farm Site. The stations were constructed by installing a steel post on either side of the creek into a concrete footing. A 3/8-inch stainless steel cable was stretched and leveled between each post using a turnbuckle to tighten the cable. The cable was permanently marked and labeled each foot dividing the stream section into one foot segments. The distance from each measuring point to the water level, stream bottom, and/or ground surface was measured at each station. These measurements, along with the flow velocity measured with a Gurley 625-F Pygmy flow meter at each segment, were combined to give a segmented cross-section of the stream at that location. Using each data set, a total area and discharge rate were calculated at the time of the readings. Two separate attempts were made during Phase I on September 7 and March 7, 1990 to measure the flow at each stream gauging station, with little success. The flow rate in Jones Creek at these times were not sufficient to be recorded by the Gurley 625-F Pygmy flow meter. These meters are rated for a minimum flow velocity of 0.05 ft/second. An attempt was made to calculate the discharge rate at each station using the minimum flow velocity rating for the meter, as the velocity at each measuring point. However, this attempt was unsuccessful. The locations of the stream gauging stations are shown on Figure 3.2.

3.11.3 Stream Staff Gauging

Due to difficulties encountered with the attempts made to measure the flow rate and discharge at stream gauging stations, additional information about ground-water discharge into Jones Creek and its intermittent tributaries flanking the site was needed. To obtain the information needed, two stream staff gauges were installed in Jones Creek during Phase I; one (SL1) adjacent to BW3 and PZ1 and the other (SL2) adjacent to BW4. During Phase II, three additional staff gauges were installed in the two large drainage channels on the north-northeast and on the south-southwest sides of the Site. Two of the three staff gauges were installed in the north-northeast tributary; one (SL3) is adjacent to the SW108/BW108 well pair and the other (SL4) is down-stream from SL3, approximately 200 feet toward Jones Creek. The third staff gauge (SL5) installed was located in the drainage channel south-southwest of the site, adjacent to the SW106/BW106 well pair. The staff gauges were constructed of one-inch by five-foot steel rods with one end sharpened to a point. The rods were driven with a sledge hammer into the creek bed to a depth of approximately two to four feet or until refusal was encountered. When the steel rod was securely in position, the top of the rod was surveyed and tied in with the elevations and locations of existing wells. Once elevations of the top of the steel rods had been determined, a measurement was made from the top of the rod to the surface of the water using an engineers fiberglass tape or an electronic water level tape. The measured distance from the top of the steel rod to the water level was subtracted from the steel rod elevation to obtain the surface water elevation. These measurements were compared to the ground-water levels in the adjacent wells to determine whether the stream is receiving baseflow from the ground water. The locations of the stream staff gauging stations are shown on Figure 3.2. Records of surface water level measurements are presented in Appendix D.

4.0 SITE HYDROGEOLOGIC CONDITIONS

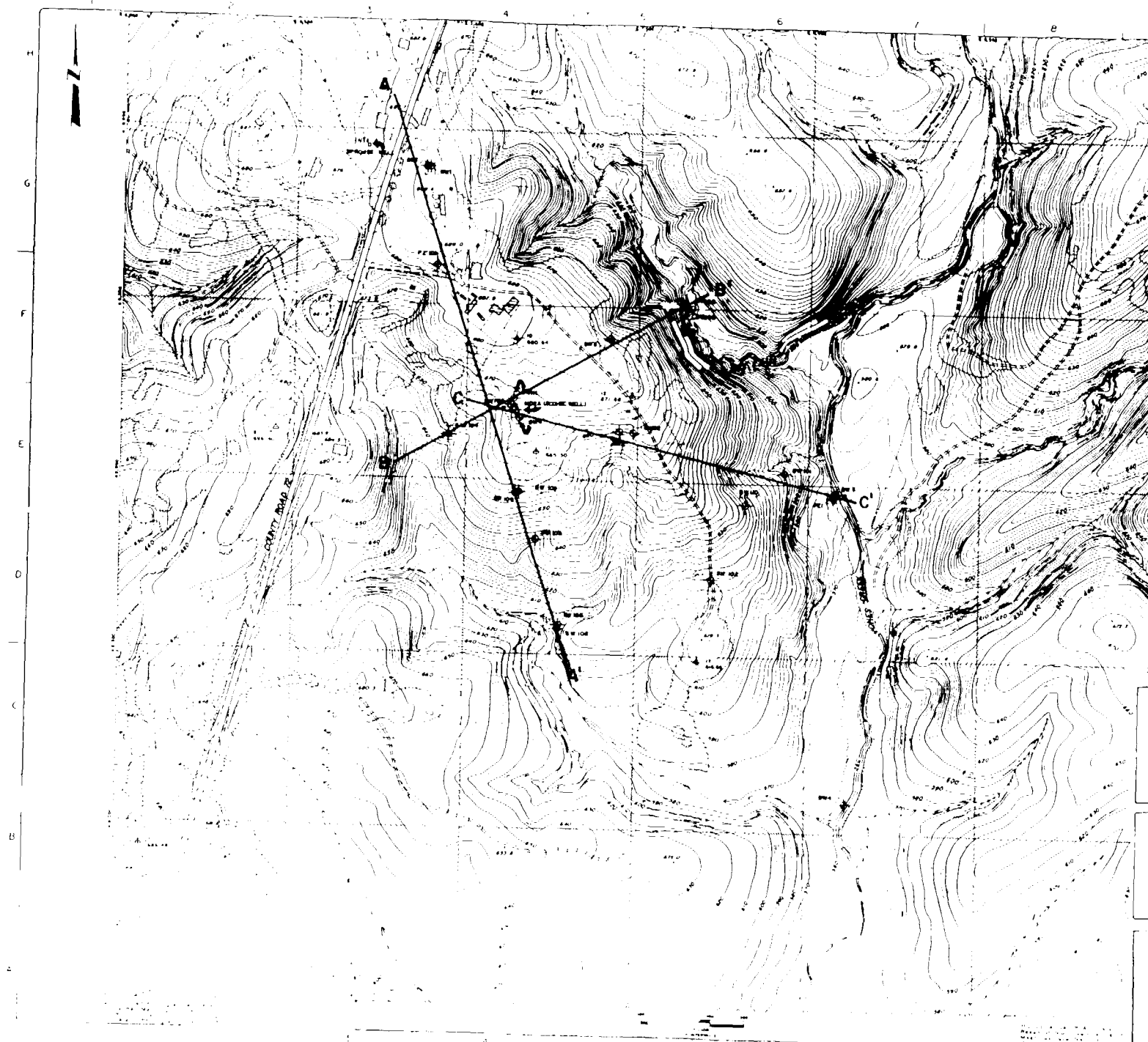
4.1 GEOLOGY

In the Piedmont province, a layer consisting of saprolite and residual soils typically overlies the bedrock. Saprolite is formed by the in-situ chemical weathering of bedrock and exhibits relict rock fabric and structure. The overlying residual soil is typically higher in clay content and lacks the relict bedrock features due to a higher degree of weathering. Subsurface conditions at the Medley Farm site were investigated by installing test pits, soil borings, and monitoring wells. Subsurface conditions encountered at the Medley Farm site are depicted in cross sections presented in Figures 4.1 through 4.4.

The residual soil at the site is absent or occurs as a thin layer overlying the saprolite. This soil layer ranges in thickness from zero to 11 feet and typically consists of clayey silt with varying amounts of fine sand, clay, mica flakes, and quartz gravel. In some areas, thin layers of clayey silt/silty clay fill were encountered. The fill was probably placed on-site during the 1983 immediate removal action and site clean-up. The fill is not significant in terms of overall site geology.

The saprolite is relatively thick across the site, ranging from 50 to 70 feet near the former disposal area to seven to 28 feet along Jones Creek at the eastern boundary of the property. The lithologic characteristics of the saprolite are similar to the residual soils and are relatively consistent both vertically and horizontally. Saprolite observed in borings drilled at the site consists predominantly of a silt with varying amounts of fine to coarse sand, clay, mica flakes, and quartz gravel. The predominant relict rock structure and foliation indicate parent rocks of metasiltstone, gneiss, and mica schist, though in several instances, the parent rock was not identifiable. For detailed lithologic descriptions and physical analysis of the soils at the site, refer to Appendices C, D and J.

210 0104



- HORIZONTAL CONTROL POINT
- VERTICAL CONTROL POINT
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- SPOT ELEVATION
- WATER
- IMPROVED ROAD
- RAILROAD
- RAILROAD
- UNIMPROVED ROAD
- POLE
- POLE
- POLE
- POLE
- POLE

Survey Location of Ground Water Monitoring Well at Medley Farm

NOTES:
Ground Water Monitoring wells were installed from May to August 1988 by Environmental Drilling and Services, Inc. at Anderson, S.C. and August to October 1988 by Atlanta Testing and Engineering, Inc. at Atlanta, GA. Monitoring was completed by March 1989. Monitoring was completed by March 1989.

FIGURE 4.1
CROSS SECTIONS
LOCATION MAP

Medley Farm Site
Gaffney, South Carolina
Remedial Investigation
Feasibility Study

SIRRINE
ENVIRONMENTAL
CONSULTANTS
Gaffney, SC

LEGEND

LITHOLOGIC CONTACT

VERY SEVERE TO SEVERELY WEATHERED ROCK
STIFF TO VERY STIFF TANK TO YELLOWISH GRAY
TO REDDISH BROWN CLAYEY SALT TO SALT WITH
THIN QUARTZ VEINS AND RELICT POLYCRYSTALLINE

VERY SEVERE TO MODERATELY WEATHERED ROCK
INCLUDES SOUND ROCK FRAGMENTS IN A SAPPHIRITE MATRIX
SLIGHT TO VERY SLIGHTLY WEATHERED GNEISS AND SCHIST
WITH VERY CLOSE TO CLOSELY SPACED IRREGULAR
FRACTURES AND JOINTS (LESS THAN 2 INCHES TO 1 FOOT
FRACTURE SPACING)

VERY SLIGHTLY WEATHERED TO FRESH GNEISS AND SCHIST
WITH MODERATELY CLOSE TO WIDELY SPACED FRACTURES
AND JOINTS (1 FOOT TO 2 FEET FRACTURE SPACING)

BORING NUMBER
GROUND SURFACE ELEVATION IN S.F.D.

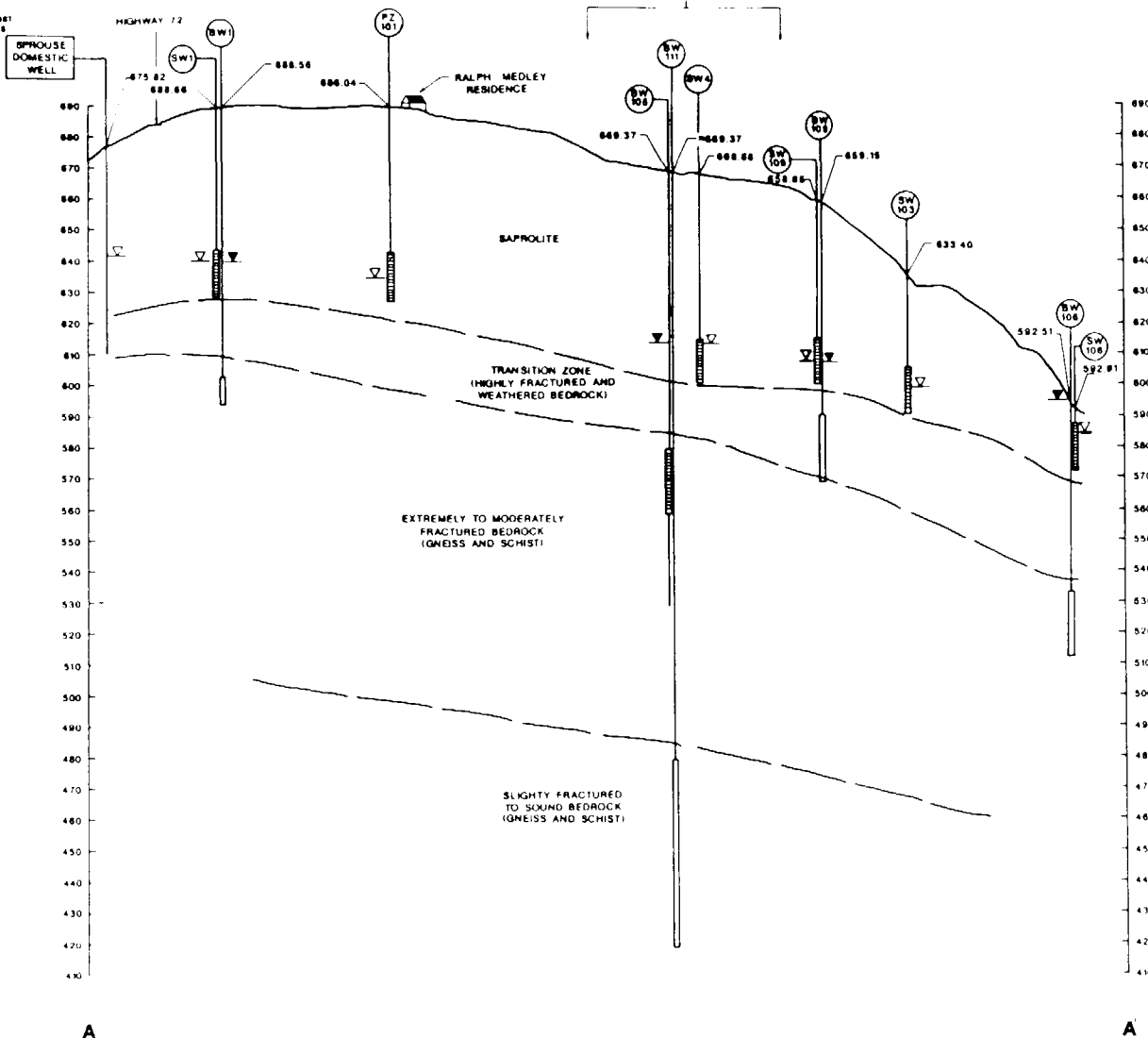
SAPPHIRITE MONITORING WELL SCREEN

BEDROCK OPEN CORNERHOLE

POTENTIOMETRIC SURFACE IN SAPPHIRITE
(1979-2000)

POTENTIOMETRIC SURFACE IN BEDROCK
(1979-2000)

LIMITS OF FORMER DISPOSAL AREA



NOTES

1. Lines representing changes in strata are based upon interpolation between subsurface exploration locations.
2. Refer to logs of subsurface explorations included in Appendix D for specific log and rock descriptions.
3. Elevations refer to the National Geodetic Vertical Datum of 1929, formerly referred to as U.S.C. & G.S. Mean Sea Level of 1929.
4. A screen was installed in the open cornerhole of bedrock well BW105 and BW107.

REV. NO.	CODE	DATE	NOTE	DESCRIPTION
1	1	1/1/00	1	1
2	2	2/1/00	2	2
3	3	3/1/00	3	3
4	4	4/1/00	4	4
5	5	5/1/00	5	5
6	6	6/1/00	6	6
7	7	7/1/00	7	7
8	8	8/1/00	8	8
9	9	9/1/00	9	9
10	10	10/1/00	10	10

SEAL

SIGNATURE

DATE

DESIGN

CHECK

DATE

SIRRIE
ENVIRONMENTAL
CONSULTANTS

Medley Farm Site
Guthrie, South Carolina
Remedial Investigation
Feasibility Study

FIGURE 4.2
GEOLOGIC CROSS SECTION
A - A

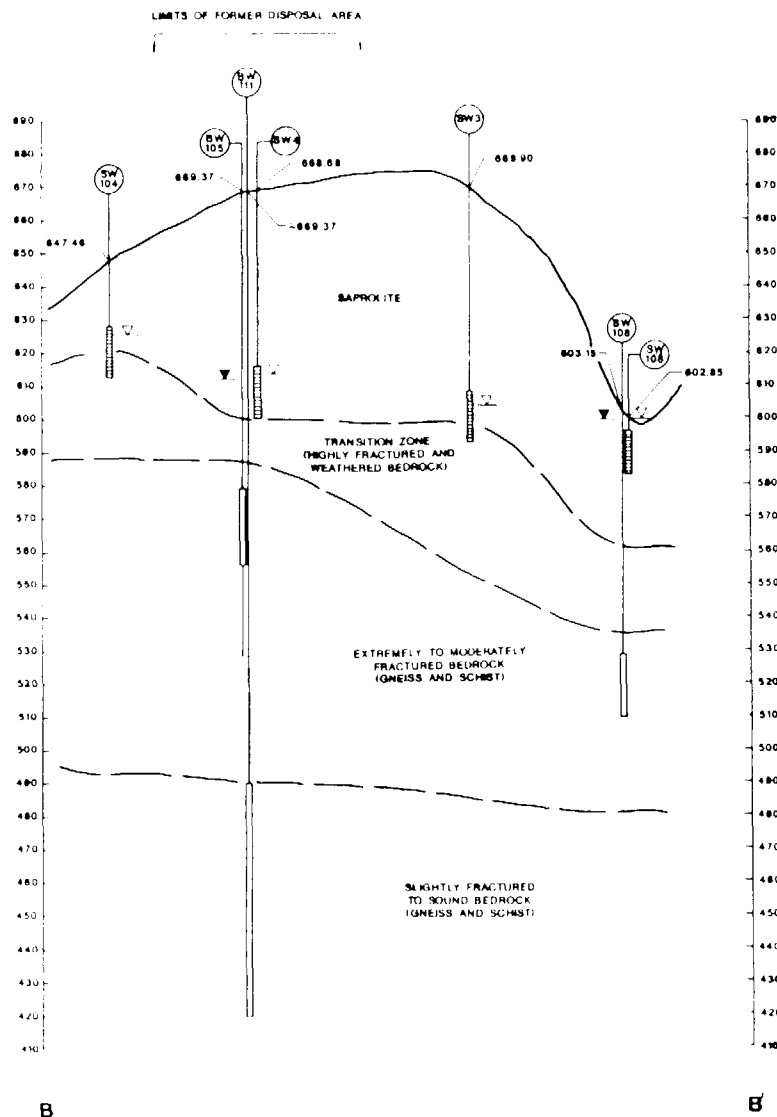
DATE: 1/1/00

BY: [Signature]

FOR: [Signature]

LEGEND

- LITHOLOGICAL CONTACT
- VERY SEVERE TO SEVERELY WEATHERED ROCK
STIFF TO VERY STIFF TANG TO FLOWING GRAV
TO BECHIN BROWN CLAYEY SALT TO SALT WITH
THIN QUARTZ VENS AND PLEISTOCENE
- TRANSITION ZONE
VERY SEVERE TO MODERATELY WEATHERED ROCK
INCLUDES SOUND ROCK FRAGMENTS IN A SAPROKITE MATRIX
- SLIGHTLY TO MODERATELY
FRACTURED BEDROCK
SLIGHT TO VERY SLIGHTLY WEATHERED UNDEE AND SCHIST
WITH VERY CLOSE TO CLOSELY SPACED ANOMALOUS
FRACTURES AND JOINTS (LESS THAN 2 INCHES TO 1 FOOT
FRACTURE SPACING)
- SLIGHTLY FRACTURED TO
AND BEDROCK
VERY SLIGHTLY WEATHERED TO FINE GRINER AND SCHIST
WITH MODERATELY CLOSE TO WELLY SPACED FRACTURES
AND JOINTS (1 FOOT TO 10 FEET FRACTURE SPACING)
- BORING NUMBER
- GROUND SURFACE ELEVATION IN FEET
- SAPROKITE MONITORING WELL SCAFF
- BEDROCK OPEN CORKHOLE
- POTENTIOMETRIC SURFACE IN SAPROKITE
(10-20-30-90)
- POTENTIOMETRIC SURFACE IN BEDROCK
(10-20-30-90)



1. Lines representing changes in strata are based upon integration between subsurface exploration activities.
2. Refer to logs of subsurface exploration included in Appendix D for specific subsurface rock descriptions.
3. Elevations refer to the National Geodetic Vertical Datum (NGVD) formerly referred to as U.S.C. & G.S. Mean Sea Level of 1929.
4. A screen was installed in the open coredness of bedrock well SW105 and SW108.

NO.	DATE	NOTE
1	10/10/90	Initial site visit and data collection.
2	10/10/90	Initial site visit and data collection.
3	10/10/90	Initial site visit and data collection.
4	10/10/90	Initial site visit and data collection.
5	10/10/90	Initial site visit and data collection.
6	10/10/90	Initial site visit and data collection.
7	10/10/90	Initial site visit and data collection.
8	10/10/90	Initial site visit and data collection.
9	10/10/90	Initial site visit and data collection.
10	10/10/90	Initial site visit and data collection.

NO.	DATE	NOTE
1	10/10/90	Initial site visit and data collection.
2	10/10/90	Initial site visit and data collection.
3	10/10/90	Initial site visit and data collection.
4	10/10/90	Initial site visit and data collection.
5	10/10/90	Initial site visit and data collection.
6	10/10/90	Initial site visit and data collection.
7	10/10/90	Initial site visit and data collection.
8	10/10/90	Initial site visit and data collection.
9	10/10/90	Initial site visit and data collection.
10	10/10/90	Initial site visit and data collection.

SIRRIE
ENVIRONMENTAL
CONSULTANTS
Greenwood, South Carolina

Medley Farm Site
Jeffrey, South Carolina
Remedial Investigation
Feasibility Study

FIGURE 4.3
GEOLOGIC CROSS SECTION
B - B'

LITHOLOGIC CONTACT

GROUND SURFACE ELEVATION IN S.F.O.

SAPROLITE MONITORING WELL BURNED

BEDROCK OPEN CORING #

POTENTIOMETRIC SURFACE IN SAPROLITE
(19-26, 30-30)POTENTIOMETRIC SURFACE IN BEDROCK
(19, 20, 20, 20)

2010 0137



NOTES

1. Lines representing changes in strata are based upon interpolation between subsurface exploration locations
2. Refer to logs of subsurface explorations included in Appendix D for specific soil and rock descriptions
3. Elevations refer to the National Geodetic Vertical Datum (NVD) formerly referred to as U.S. & G.S. Mean Sea Level of 1929
4. A screen was installed in the open corehole of bedrock well BW105 and BW2

NO
CODE
CIRCLES
DATE
NOTE
FEB 1964
BY
ISSUE CODE
A-44, M-44, G-44
H-44, K-44

St A.

1. *Staphylococcus aureus*

1. $\frac{1}{2}$

姓名 _____ 学号 _____
 班级 _____ 日期 _____
 教师 _____



SIRRINE
ENVIRONMENTAL
CONSULTANTS

Gravel, 50% or more (10)

Medley Farm Site
Gaffney, South Carolina

Remedial Investigation Feasibility Study

FIGURE 4.4
GEOLOGIC CROSS SECTION
C - C

LINEAR ALGEBRA

The bedrock was investigated by continuous coring at numerous locations. The bedrock consists primarily of a gneiss that varies from a schistose gneiss to a quartzo-feldspathic and quartz-amphibole gneiss. The bedrock is predominantly hard, slightly weathered to fresh, gray, and fine to medium-grained, with closely to moderately closely (0.5 to 2.5 feet) spaced joints. The joints tend to be smooth to rough and moderately dipping (35 to 55 degrees). Foliation of the bedrock is moderately dipping (35 to 55 degrees) to steep (55 to 85 degrees).

Auger refusal was encountered at depths ranging from approximately 70 to 100 feet within the former disposal area. The overburden thickness decreases outward toward the boundaries of the site, to a minimum of approximately 20 feet adjacent to Jones Creek. Evidence of ground water movement through the bedrock was observed in the form of iron oxide staining along joint surfaces. Detailed rock descriptions for each boring are included on the Test Boring Reports presented in Appendix D. Photographs of bedrock cores retrieved from bedrock borings are presented in Appendix K.

4.2 Hydrogeology

Ground water at the Medley Farm site occurs in the saprolite, in the zone of highly fractured and weathered bedrock identified as the transition zone, and in moderately fractured bedrock underlying the site. Depth to ground water at the site is on the order of 56 to 68 feet in the disposal area, decreasing to six to eight feet at Jones Creek.

4.2.1 Aquifer Description

In general, an aquifer system consisting of flow through both porous and fractured media exists in the Piedmont Province and at the Medley Farm site. The water table generally occurs in the saprolite across most of the Medley Farm site, with the saprolite serving as a porous medium for ground water flow. In the vicinity of BW2 at the eastern edge of the former disposal area, the water table occurs in the bedrock transition zone. Although the

ground water occurring in the saprolite and bedrock is part of an interconnected aquifer system, the ground water in the bedrock at the site is under semi-confined to confined conditions, with the exception of the BW2 vicinity where the water table occurs in the bedrock.

Hydraulic conductivity (K) values in the saprolite, calculated from slug test data, are relatively low (Table 4.1), ranging from 2.96×10^{-3} to 3.05×10^{-5} cm/sec. These values appear reasonable based on the observed nature of the soil and values of 10^{-5} to 10^{-1} cm/sec reported in Freeze and Cherry (1979) for silty soils similar to those encountered at the Medley Farm site.

Hydraulic conductivities of the bedrock aquifer were estimated to range from 7.09×10^{-5} cm/sec to 4.28×10^{-3} cm/sec from both slug tests (Table 4.1) and water pressure test data (Table 4.2) excluding deep bedrock wells BW111 and BW112. Hydraulic conductivities from the water-pressure tests are considered more representative of undisturbed bedrock conditions than those determined from slug tests. Because the bedrock has been disturbed during drilling and development, the fractures immediately adjacent to the corehole would be free of fracture-filling material or sediment normally present under undisturbed conditions. Data from slug tests would therefore result in higher values of hydraulic conductivity. This was observed in the hydraulic conductivity values derived from the bedrock wells at the Medley Farm site. The lowest hydraulic conductivity values (on the order of 10^{-7} cm/sec) were observed in deep bedrock wells BW111 and BW112. The low hydraulic conductivity values indicate that deep bedrock at the site is essentially impermeable to ground water flow.

The shallow saprolite has a higher porosity than the bedrock, but due to the low hydraulic conductivity, the saprolite acts mainly as a storage and recharge source for the bedrock. Yields from wells completed in the saprolite generally are very low. Yields from bedrock wells generally are relatively high, but depend on the nature, quantity, and interconnection of the secondary (fracture) porosity the well encounters. The bedrock wells completed in

Table 4.1 SUMMARY OF FIELD PERMEABILITY TEST RESULTS

SLUG TEST ANALYSIS - MODIFIED BOUWER-RICE METHOD

Client: MEDLEY FARM RI/FS

Location: GAFFNEY, SOUTH CAROLINA

Job Number: G-8026

Porosity of the sand pack: 0.30

Well																	
Number	Rd(ft)	rc'(ft)	Le(ft)	rw(ft)	Le/rw	Lw(ft)	H(ft)	A	B	C	yc(ft)	yt(ft)	Y(sec)	K(ft/sec)	K(ft/day)	K(cm/sec)	T(gpd/ft)
BW1-F	0.158	0.158	9.20	0.158	58.23	44.44	50.0	3.208	0.533	2.918	0.983	0.010	208.20	1.05E-04	9.10	3.21E-03	3.402
BW1-R	0.158	0.158	9.20	0.158	58.23	44.44	50.0	3.208	0.533	2.918	1.844	0.010	178.20	1.40E-04	12.14	4.28E-03	4.539
BW2-F	0.158	0.158	20.64	0.158	130.63	18.38	50.0	4.875	0.840	4.875	0.471	0.010	102.80	7.50E-05	6.48	2.29E-03	2.424
BW2-R	0.158	0.158	20.64	0.158	130.63	18.38	50.0	4.875	0.840	4.875	0.500	0.010	109.80	7.12E-05	6.15	2.17E-03	2.300
BW3-F	0.158	0.158	20.00	0.158	126.58	48.84	50.0	4.833	0.791	4.833	2.850	0.010	219.00	8.64E-05	5.74	2.02E-03	2.147
BW3-R	0.158	0.158	20.00	0.158	126.58	48.84	50.0	4.833	0.791	4.833	3.360	0.010	252.00	5.94E-05	5.13	1.81E-03	1.919
BW4-F	0.158	0.158	13.00	0.158	82.28	25.94	50.0	3.933	0.648	3.888	2.150	1.180	300.00	8.52E-06	0.56	1.99E-04	2.11
BW4-R	0.158	0.158	13.00	0.158	82.28	25.94	50.0	3.933	0.648	3.888	2.111	0.900	480.00	5.83E-06	0.49	1.72E-04	1.82
SW1-R	0.083	0.238	15.20	0.418	36.54	8.28	50.0	2.800	0.398	2.288	0.073	0.080	800.00	1.25E-06	0.11	3.80E-05	40
SW3-R	0.083	0.238	15.20	0.418	36.54	8.78	50.0	2.800	0.398	2.288	0.208	0.100	111.00	2.58E-06	2.21	7.79E-04	828
SW4-R	0.083	0.238	15.20	0.418	36.54	8.34	50.0	2.800	0.398	2.288	0.175	0.148	120.00	5.34E-06	0.48	1.83E-04	173
SW102-R	0.083	0.238	8.65	0.418	20.79	8.65	50.0	2.210	0.360	1.710	0.263	0.090	120.00	5.17E-06	4.47	1.58E-03	1,871
SW103-R	0.083	0.238	7.38	0.418	17.74	7.38	50.0	2.120	0.330	1.570	0.188	0.131	420.00	3.89E-06	0.32	1.12E-04	119
SW104-R	0.083	0.238	11.63	0.418	27.98	11.63	50.0	2.430	0.398	2.000	1.000	0.090	480.00	2.54E-06	2.20	7.75E-04	822
SW106-R	0.083	0.238	13.72	0.418	32.98	13.72	50.0	2.590	0.420	2.190	0.900	0.070	420.00	2.79E-06	2.41	8.51E-04	903
SW108-R	0.083	0.238	13.78	0.418	33.08	13.78	50.0	2.590	0.420	2.200	1.250	0.800	3380.00	1.00E-06	0.09	3.05E-06	32
SW109-R	0.083	0.238	7.28	0.418	17.45	7.28	50.0	2.110	0.330	1.580	1.270	0.217	120.00	9.70E-06	8.38	2.98E-03	3,134

F=INDICATES FALLING HEAD SLUG TEST

R=INDICATES RISING HEAD SLUG TEST

3
10
0113

TABLE 4.2
MEDLEY FARM SITE RI/FS
HYDRAULIC CONDUCTIVITY (K) VALUES - WATER PRESSURE TESTS

<u>WELL I.D.</u>	<u>DATE TESTED</u>	<u>AMOUNT OF WATER INTRODUCED (Gal)</u>	<u>K (ft/sec)</u>	<u>K (ft/day)</u>	<u>K (cm/sec)</u>
BW2	7-31-89	280.2	6.97×10^{-6}	0.604	2.13×10^{-4}
BW3	7-24-89	217.3	1.14×10^{-5}	0.989	3.49×10^{-4}
BW4	7-20-89	76.0	5.1×10^{-6}	0.442	1.56×10^{-4}
BW106	9-26-90	720.0	1.08×10^{-5}	1.03	3.63×10^{-4}
BW108	9-18-90	109.0	2.32×10^{-6}	0.201	7.09×10^{-5}
BW109	10-2-90	526.5	8.67×10^{-6}	0.751	2.65×10^{-4}
BW110	9-28-90	434.6	1.35×10^{-5}	1.17	4.13×10^{-4}
BW111	10-10-90	113.0	2.78×10^{-8}	.0024	8.49×10^{-7}
BW112	10-16-90	51.0	2.56×10^{-8}	.0022	7.82×10^{-7}

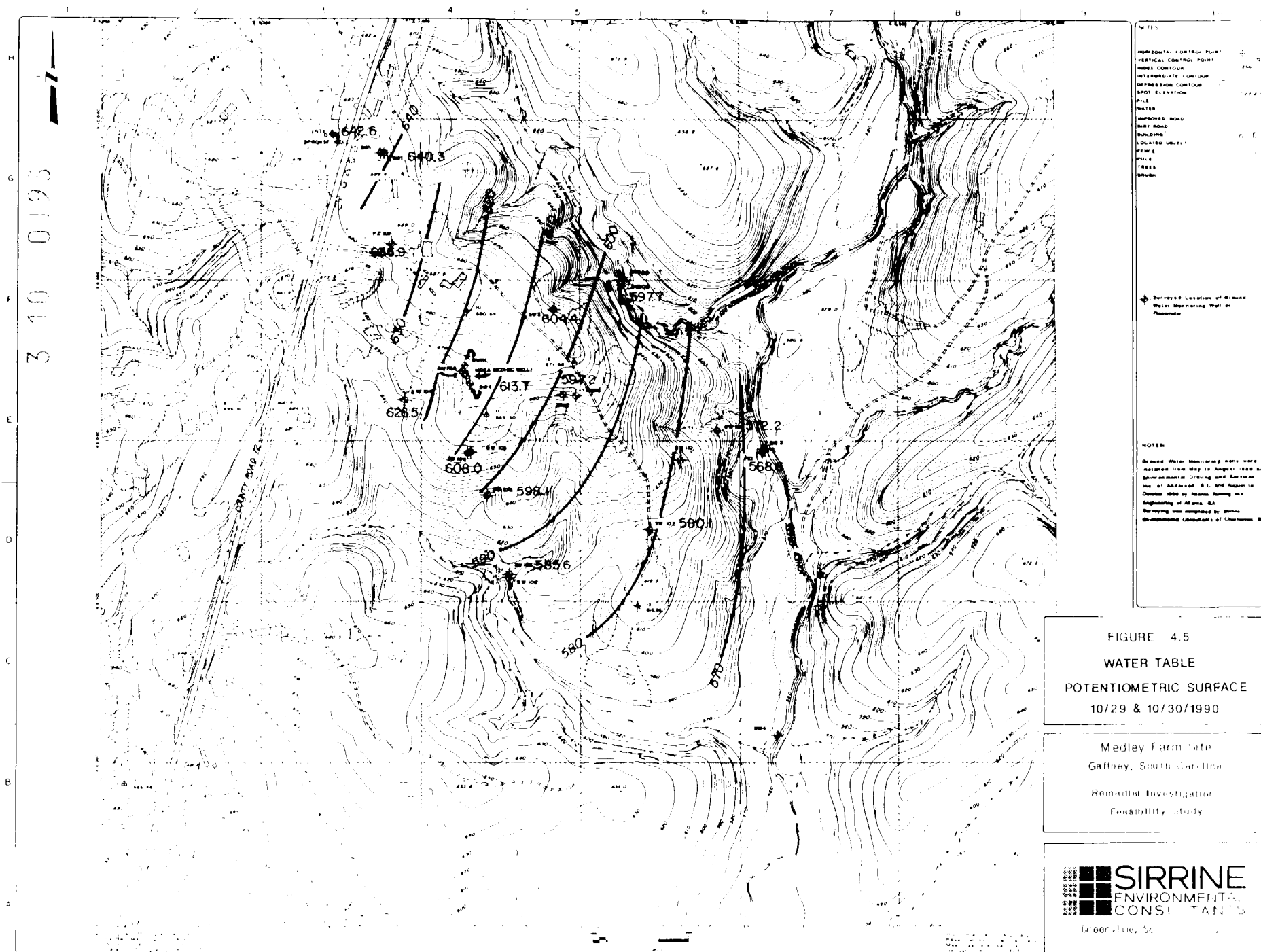
310 0191

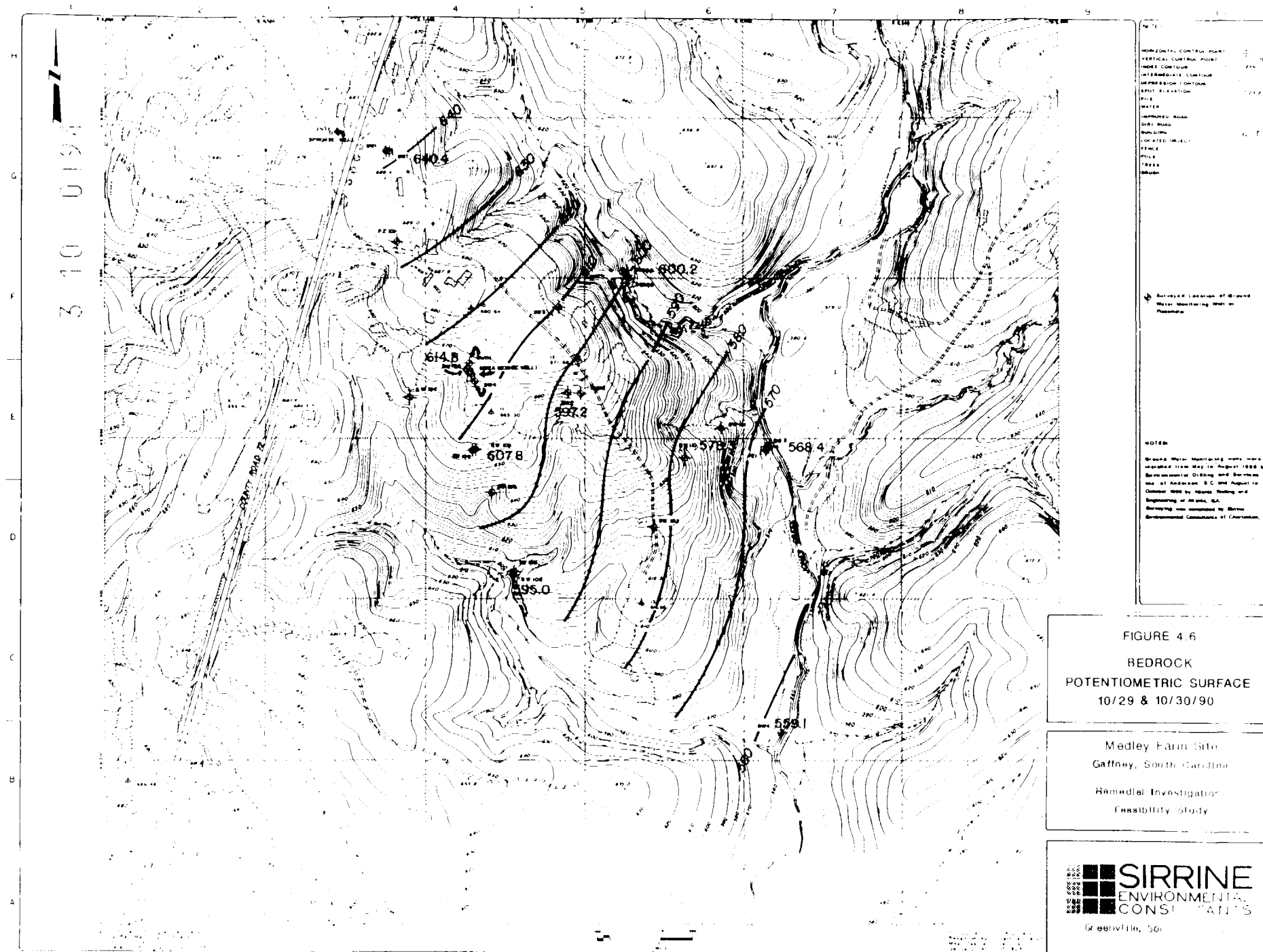
the moderately fractured bedrock at the Medley site demonstrate relatively high yields (five to seven gallons per minute). Ground water in the saprolite wells, however, can be evacuated completely with a bailer, with the time for complete recovery exceeding several hours.

4.2.2 Ground Water Flow Directions and Gradients

Ground water flow in the water-table aquifer at the Medley Farm site is primarily to the southeast (Figure 4.5), towards Jones Creek based on water level measurements made at the site. The water table hydraulic gradient changes slightly across the site, ranging from 0.056 beneath the former disposal area to 0.046 further downgradient. The primary direction of ground-water flow in the bedrock aquifer is also to the southeast (Figure 4.6), with an average hydraulic gradient of 0.042.

Water level measurements were made on September 27, 1990, in the Sprouse water well, monitoring wells SW1 and BW1, and piezometer PZ101 to evaluate the hydraulic relationship between the Sprouse well and the Medley Farm site. The water level in the Sprouse well was determined to be 642.6 feet above Mean Sea Level (MSL). This elevation is approximately two feet above the water levels observed in SW1 (640.50 feet above MSL) and BW1 (640.55 feet above MSL), and approximately six feet above the water level in PZ101 (637.08 feet above MSL). The elevation of the measuring point was surveyed to establish an accurate point from which to determine a water level elevation. Water level measurements and reference point elevations are presented in Appendix G. The depth of the Sprouse well was determined to be approximately 64 feet as determined by tagging the bottom of the well with a stainless steel weight attached to a fiberglass measuring tape. Based on this information, it appears that the Sprouse well draws water from the saprolite and the bedrock transition zone at a location hydraulically upgradient from the Medley Farm site.





Water-level measurements made in six saprolite/bedrock well clusters indicate upward vertical hydraulic gradients of varying magnitude across most of the site. Upward vertical gradients were observed at four monitoring locations (BW1/SW1, BW105/SW4, BW106/SW106, and BW108/SW108). Downward vertical gradients were observed at only two locations (BW3/PZ1 and BW109/SW109) monitored during October 1990. Observation of the magnitude and direction of vertical gradients provides an indication of the potential for vertical migration of contaminants from the site. The presence of upward vertical gradients reduces the potential for contaminants to move downward in the aquifer. Downward vertical gradients are expressed as positive numbers; upward vertical gradients are expressed as negative numbers.

Water levels in SW1 are generally on the order of tenths of a foot lower than water levels in BW1 (Figure 4.7), though one set of measurements made in September 1989 demonstrated a greater difference in water levels. A vertical gradient of -0.0036 was calculated for this location (October 1990). Water level measurements in SW4 and BW105 during 1990 demonstrate the hydraulic head in BW105 is generally one-half to one foot higher than the hydraulic head in SW4 (Figure 4.8). An upward vertical gradient of -0.0285 was calculated for this well pair.

Greater differences in hydraulic head are observed in well pairs located adjacent to the tributaries to Jones Creek. The greatest vertical hydraulic head difference at the site is observed in well pair SW106 and BW106 (Figure 4.9), with water levels in BW106 occurring nine to ten feet above water levels in SW106 and a vertical hydraulic gradient of -0.1638 present.

The hydraulic head in BW108 is approximately 2.5 feet above the hydraulic head in SW108 (Figure 4.10). The vertical hydraulic gradient calculated from the October 1990 water level data, is -0.0367, similar to the vertical gradient observed at SW4/BW105.

Figure 4.7
 Medley Farm Site RI
 Hydrograph for Wells BW1 and SW1

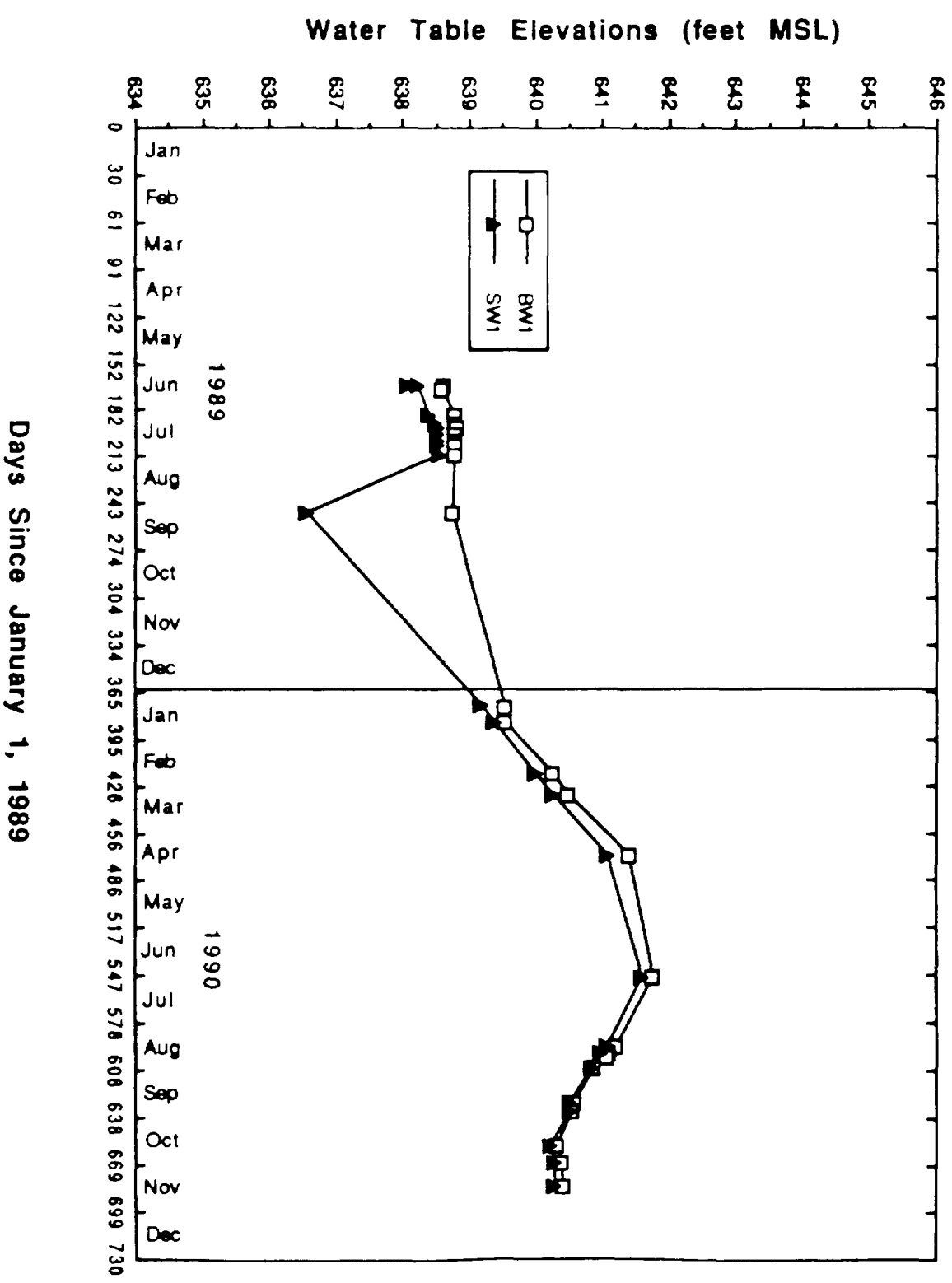


Figure 4.8
Medley Farm Site RI
Hydrograph for Wells BW105 and SW4

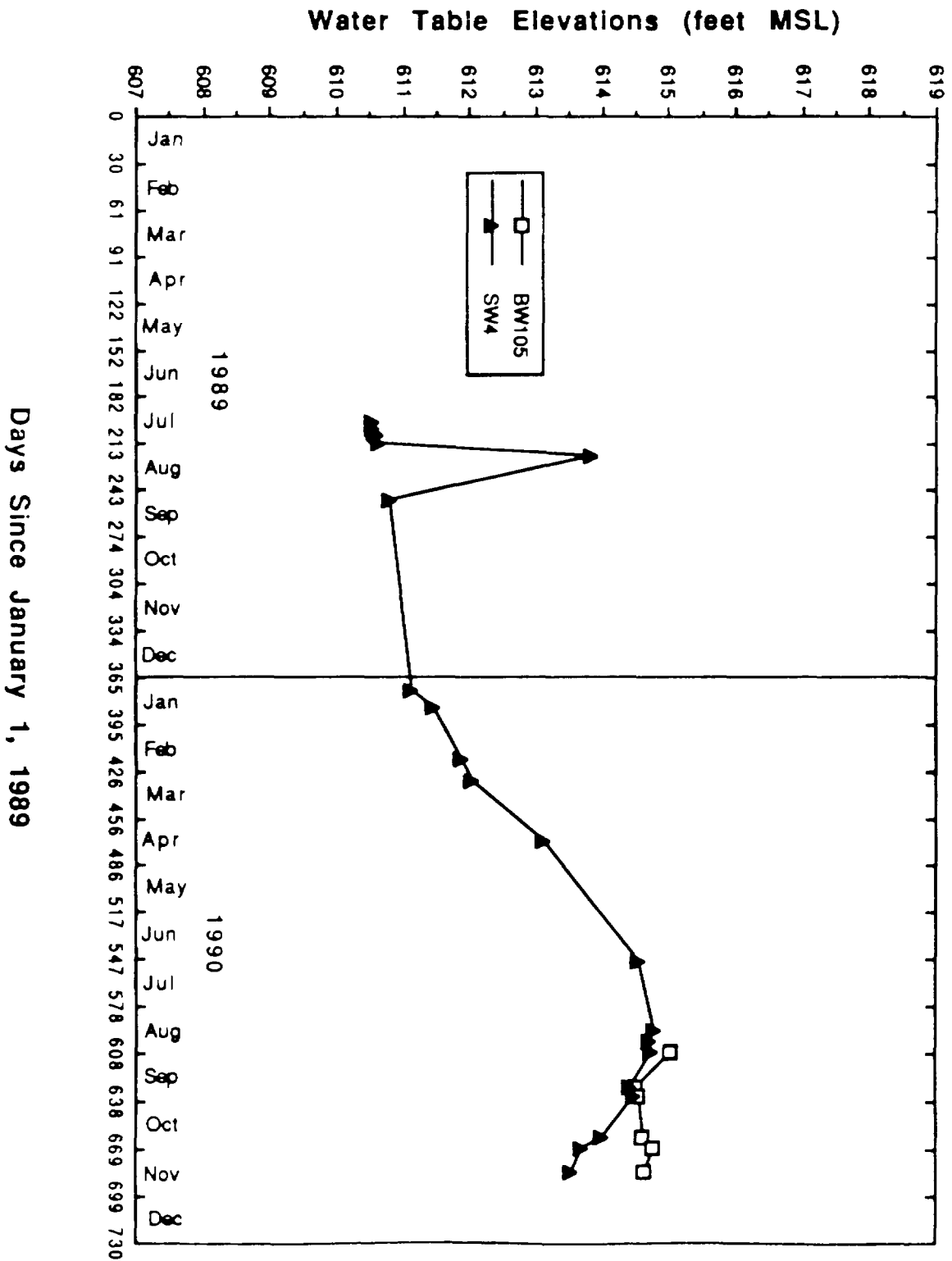
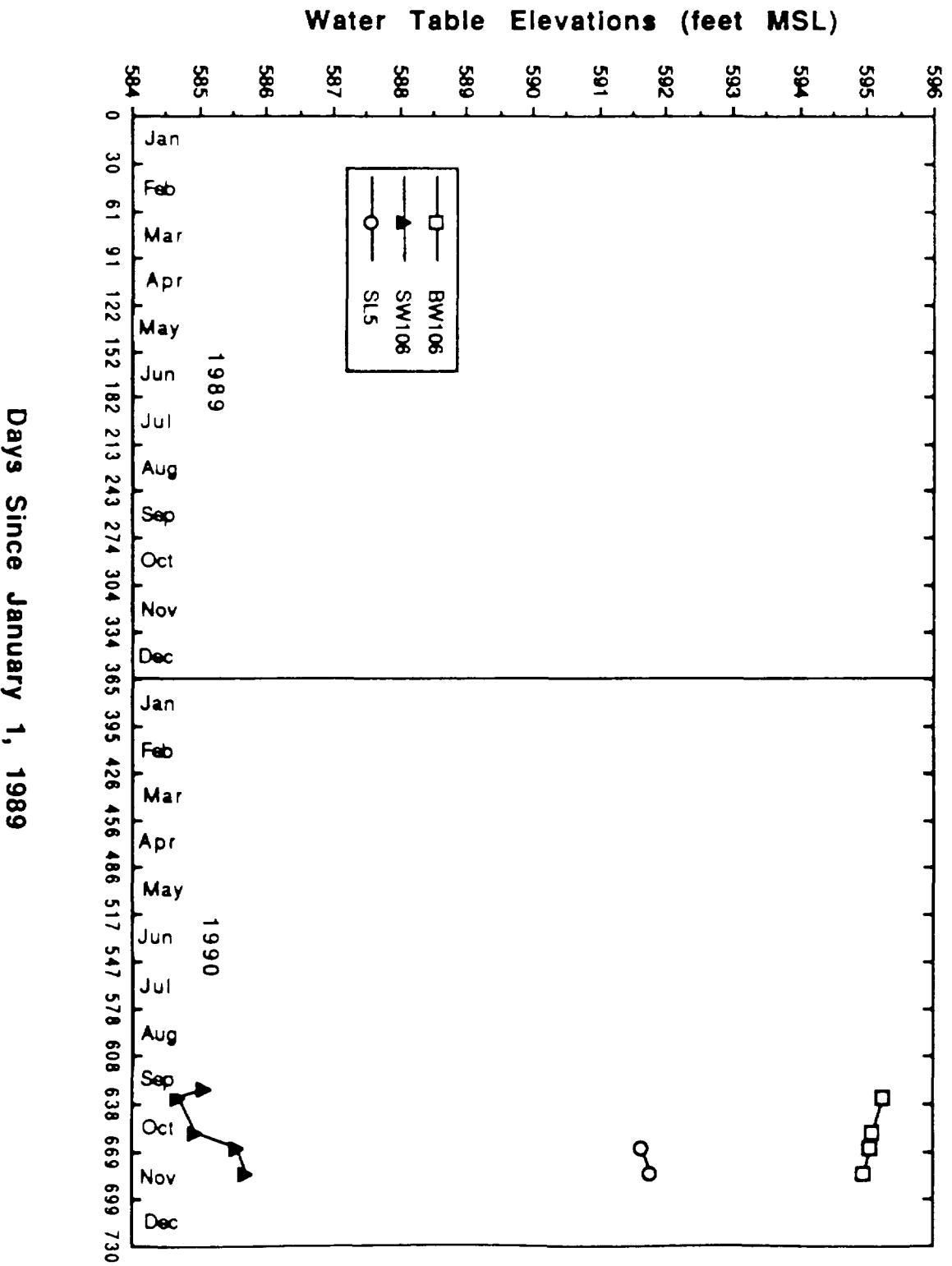


Figure 4.9
Medley Farm Site RI
Hydrograph for Wells BW106 and SW106, and Staff Gauge SL5



Water Table Elevations (feet MSL)

Y-axis scale: 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606

X-axis labels: 1989 (Jan-Dec), 1990 (Jan-Dec)

Legend:

- BW108 (Square)
- SW108 (Triangle)
- SL3 (Circle)

Date	BW108 (feet MSL)	SW108 (feet MSL)	SL3 (feet MSL)
1989 Jan			
1989 Feb			
1989 Mar			
1989 Apr			
1989 May			
1989 Jun			
1989 Jul			
1989 Aug			
1989 Sep			
1989 Oct			
1989 Nov			
1989 Dec			
1990 Jan			
1990 Feb			
1990 Mar			
1990 Apr			
1990 May			
1990 Jun			
1990 Jul			
1990 Aug			
1990 Sep	600.5	598.5	
1990 Oct	600.0	598.0	595.5
1990 Nov	599.5	597.5	595.0
1990 Dec			

Days Since January 1, 1989

Downward vertical gradients were observed intermittently at the PZ1/BW3 well pair during October 1990, when the calculated vertical hydraulic gradient was +0.0035. The hydraulic head in PZ1 is generally lower than the hydraulic head in BW3 (Figure 4.11) located next to Jones Creek. However, during March and October 1990 and early August 1989, hydraulic heads in PZ1 were higher than heads in BW3. These occurrences appear to coincide with high flows in Jones Creek, indicating localized effects on water levels in the piezometer due to flooding in the creek. Downward vertical gradients have also been observed in SW109/BW109 (Figure 4.12), with a calculated vertical gradient of +0.0080.

Jones Creek and its tributaries serve as zones of ground-water discharge from the Medley Farm site. Water levels in the saprolite and bedrock adjacent to Jones Creek (PZ1 and BW3) are consistently above water levels observed in Jones Creek at staff gauge SL1 (Figure 4.11). Similarly, water levels in the saprolite and bedrock at SW108 and BW108 are greater than water levels observed in the tributary at staff gauge SL3 (Figure 4.10). The water level in BW106 is greater than the water level observed in the tributary at staff gauge SL5. However, the water level in SW106 is less than the water level observed at staff gauge SL5, indicating localized surface water recharge to the saprolite at this location.

Water level measurements and reference point elevations for monitoring wells, piezometers, stream staff gauges, and the Sprouse well are presented in Appendix G.

Horizontal ground-water flow velocities were calculated using the hydraulic gradients determined for the water table and bedrock potentiometric surfaces, and average hydraulic conductivity values determined for the saprolite and bedrock aquifer materials. Velocities were calculated using the following equation:

Figure 4.11
Medley Farm Site RI
Hydrograph for Wells BW3 and PZ1, and Staff Gauge SL1

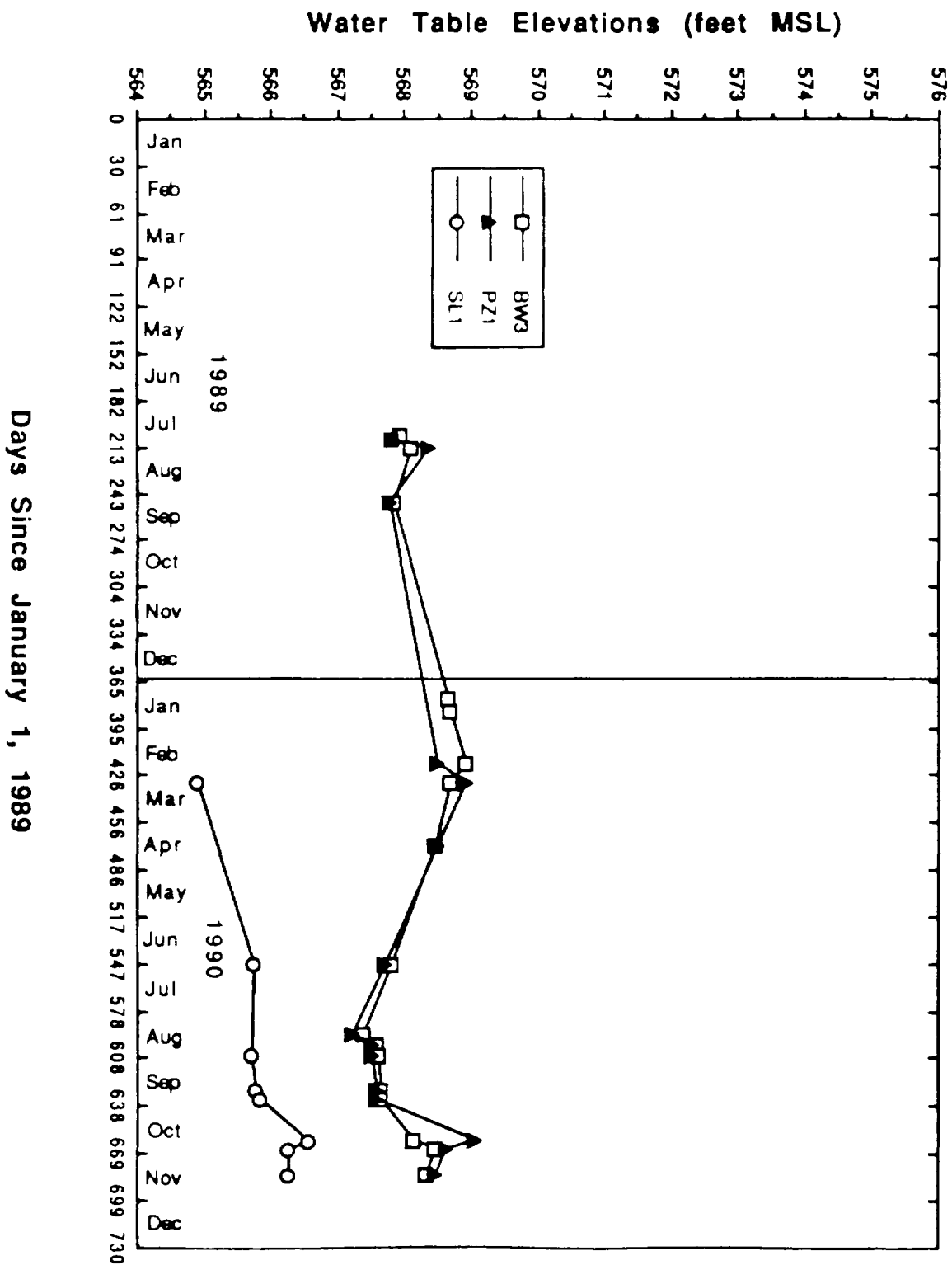
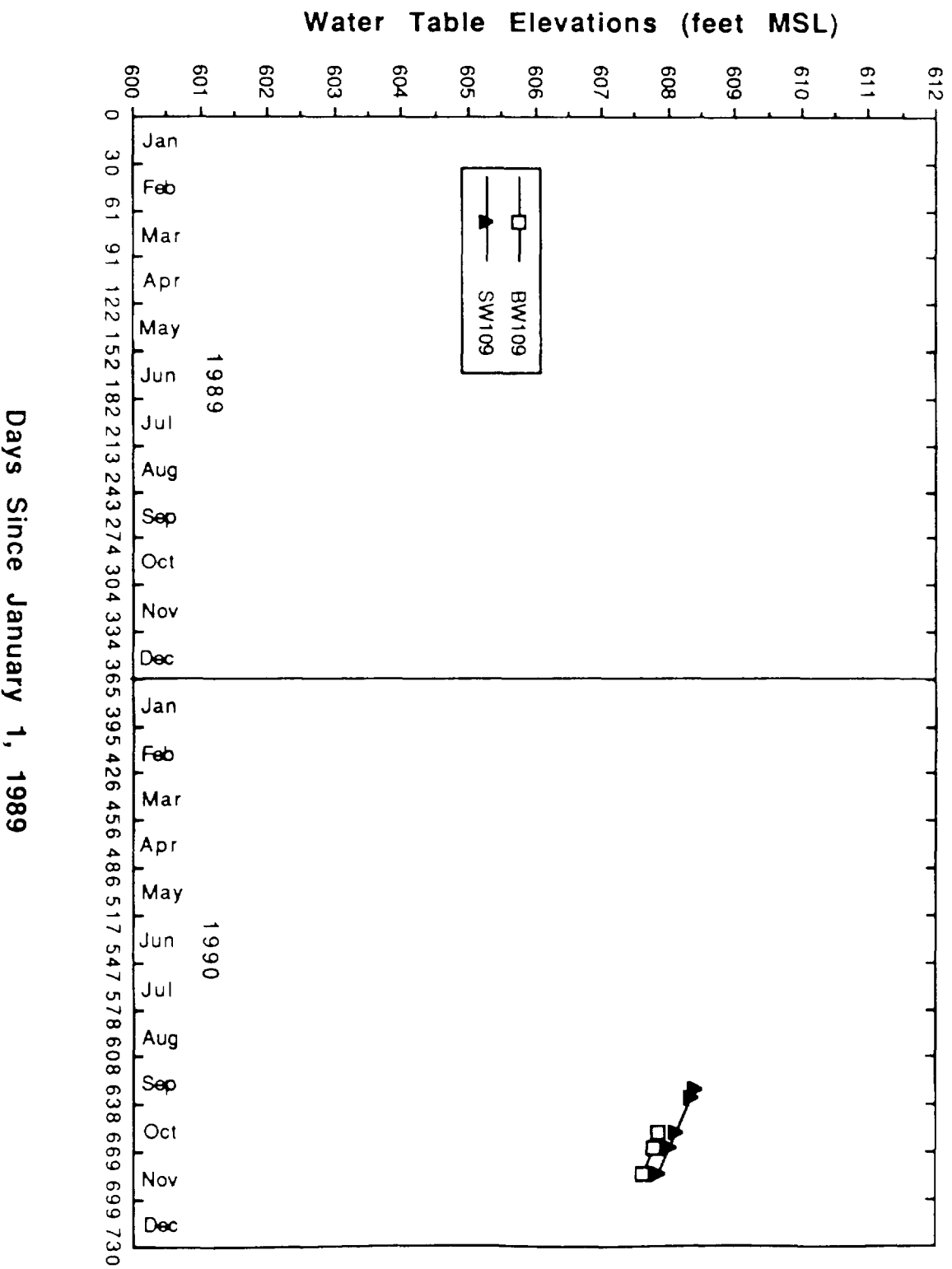


Figure 4.12
Medley Farm Site RI
Hydrograph for Wells BW109 and SW109



$$V = KI/n_e$$

where V = Flow velocity (ft/day)
 K = Hydraulic conductivity (ft/day)
 I = Hydraulic gradient (dimensionless)
 n_e = Effective porosity (fraction)

Calculations for ground water flow velocities in the water table aquifer and for ground water flow in the bedrock were performed using the following values:

K = 2.29 ft/day (average hydraulic conductivity in the saprolite based on slug tests) and 0.741 ft/day (average hydraulic conductivity in the bedrock based on water pressure tests)
 I = 0.046 and 0.056 (for the water table aquifer) and 0.042 (for the bedrock)
 n_e = 0.1 (assumed value)

Based on these values, ground water flow velocities in the water table aquifer are estimated to range from 1.05 ft/day (384 ft/year) to 1.28 ft/day (468 ft/year). Ground water flow velocity in the bedrock is estimated to be 0.31 ft/day (81 ft/year). Due to the fact that the effective porosity value used (0.1) is a conservative number, it is quite likely that the actual flow velocity is substantially less than the calculated values. For example, if the effective porosity value is 0.2, the calculated velocity would be one-half of that calculated for a porosity of 0.1. The value of 0.1 results in a high ground-water velocity which provides a maximum calculated distance of contaminant movement. Therefore, these calculated ground water flow velocities would result in an overestimation of the rate and distance of contaminant migration from the site.

5.1 INTRODUCTION

This section presents the chemical analytical results for environmental samples collected during the Medley Farm RI, and a discussion of the significance of the results. Significant analytical results used to evaluate the nature and extent of contamination present at the site are discussed in Section 6.0 of this RI report.

Chemical analyses were performed on a variety of natural media including ground water, surficial and deep soils, surface water, and stream sediments. Laboratory analyses were performed by Radian Corporation and Ecotek, both laboratories in EPA's Contract Laboratory Program (CLP), in accordance with standard CLP protocols. CLP analytical methods employed are summarized in Table 5.1. Ground-water and soil samples collected during Phase IA of the RI were subjected to complete TCL/TAL analyses which includes volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and inorganic compounds (metals and cyanide). Samples subjected to TCL/TAL analyses during Phase IA of the RI include; soil samples collected for source characterization from test pits TP1, TP2, TP3, TP4, TP5, TP7, TP9, and TP10; and ground-water samples collected from monitoring wells SW3, SW4, BW2 and BW4.

The results of the soil and ground-water analyses from Phase IA were evaluated and a list of indicator parameters was developed. The list of indicator parameters was approved by EPA for analyses of samples collected during Phase IB and Phase II of the RI.

Samples subjected to indicator parameter analyses include: soil samples collected from test pits TP11 through TP16; soil samples collected from all soil borings; one complete round of ground-water samples collected from monitoring wells installed during Phase I of the RI; one complete round of ground-water samples collected during Phase II from monitoring wells installed during Phases I and II; and all surface water and sediment samples.

TABLE 5.1
CLP ORGANIC ANALYTICAL METHODOLOGIES³ 10 0205

<u>Compounds/Analytes</u>	<u>Technique</u>	<u>Methodology</u>
Volatiles	Purge & Trap GC/MS	CLP modified EPA Method 624
Semivolatiles	GC/MS	CLP modified EPA Method 625
Pesticides/PCBs	GC/EC	CLP modified EPA Method 608

TABLE 5.1 (Continued)
CLP INORGANIC ANALYTICAL METHODOLOGIES

3 10 0206

<u>Compounds/Analytes</u>	<u>Technique</u>	<u>Methodology</u>
Aluminum	ICP	CLP Modified Method 200.7
Antimony	ICP	CLP Modified Method 200.7
Arsenic	AA Furnace	CLP Modified Method 206.2
Barium	ICP	CLP Modified Method 200.7
Beryllium	ICP	CLP Modified Method 200.7
Cadmium	ICP	CLP Modified Method 200.7
Calcium	ICP	CLP Modified Method 200.7
Chromium	ICP	CLP Modified Method 200.7
Cobalt	ICP	CLP Modified Method 200.7
Copper	ICP	CLP Modified Method 200.7
Iron	ICP	CLP Modified Method 200.7
Lead	AA Furnace	CLP Modified Method 239.2
Magnesium	ICP	CLP Modified Method 200.7
Manganese	ICP	CLP Modified Method 200.7
Mercury	Manual Cold Vapor	CLP Modified Method 245.1
Nickel	ICP	CLP Modified Method 200.7
Potassium	ICP	CLP Modified Method 200.7
Selenium	AA Furnace	CLP Modified Method 270.2
Silver	ICP	CLP Modified Method 200.7
Sodium	ICP	CLP Modified Method 206.2
Thallium	AA Furnace	CLP Modified Method 279.2
Vanadium	ICP	CLP Modified Method 200.7
Zinc	ICP	CLP Modified Method 200.7
Cyanide	Titrimetric, Spectrophotometric	CLP Modified Method 335.2

AA - Atomic Absorption
GC/EC - Gas Chromatograph/Electron Capture
GC/MS - Gas Chromatograph/Mass Spectrometry
ICP - Inductively Coupled Plasma

Selection of indicator parameters used for Phase IB and Phase II analyses are discussed in Section 5.2.

Additionally, background soil samples collected in soil boring SB1 from three depth intervals during Phase IB were analyzed for TAL metals and pesticides. Surface soil samples collected from 15 locations during Phase II were analyzed for Pesticides/PCBs, VOCs, and SVOCs. One additional surface soil sample collected during Phase II was analyzed for SVOCs.

Ground water samples collected during Phase IB and Phase II from background wells SW1 and BW1 were also analyzed for TAL metals.

Complete tables presenting the results of all laboratory analyses performed during the RI are contained in Appendix L. Laboratory Case Narratives are also included in Appendix L.

5.2 INDICATOR PARAMETERS

Indicator parameters for the Medley Farm site were selected based on the results of TCL/TAL analyses completed during Phase IA of the RI. Residual chemicals detected by the TCL/TAL analyses of soil and ground-water media performed during Phase IA consist primarily of volatile and semi-volatile organic compounds. VOCs were detected both in soil and in ground water samples collected during Phase IA. SVOCs were detected in soil samples, but were not detected at levels above Sample Quantitation Limits (SQLs) in any ground-water samples analyzed during Phase IA. Trace levels of bis (2-ethylhexyl) phthalate (BEHP) were detected in ground water, but this SVOC is a common lab artifact which was also detected in the Quality Assurance/Quality Control (QA/QC) blanks. No pesticides or PCB's were detected in any of the ground-water samples analyzed during Phase IA.

Of the pesticide/PCB analyses of soil samples that were conducted during Phase I of the RI, only 12 detects were recorded. The highest detected PCB concentration in soils was determined to be 5.7 ppm, well below the TSCA PCB Spill Cleanup Policy recommended cleanup level of 10 ppm established for nonrestricted access areas as defined in 40 CFR 761.125(c)(4)(v). Because of the limited number of samples in which PCBs were detected at the site, PCBs were excluded from the list of indicator parameters. Surface soil samples were collected during Phase II and analyzed for PCBs in response to SCDHEC comments, however, to supplement PCB analyses completed during Phase I.

Elevated levels of metals observed in soil and ground water are restricted to iron, aluminum and manganese. These elements are natural components of the bedrock, saprolite and residual soils present at the site and appear to be representative of local geologic background conditions. No elevated levels of cyanide were observed in soil or ground-water samples.

Based on the Phase IA results described above, indicator parameters for Phase IB and subsequent analyses were selected as follows:

<u>Sample Matrix</u>	<u>Analytical Fraction</u>
Ground Water:	TCL Volatile Organics
Surface Water:	TCL Volatile Organics TCL Semi-Volatile Organics
Soils:	TCL Volatile Organics TCL Semi-Volatile Organics
Stream Sediments:	TCL Volatile Organics TCL Semi-Volatile Organics

VOCs were selected as indicator parameters for the ground water medium because these were the only compounds detected in this medium. VOCs and SVOCs were selected as indicator parameters for the soil medium since these two types of organic compounds were

consistently detected in soil samples. VOCs and SVOCs were selected as indicator parameters for the surface water and stream sediment media, due to the potential for transport of VOCs via ground water discharge to surface water, and the potential for transport of SVOCs via surface soils carried to the stream by erosion.

5.3 POTENTIAL EVALUATION CRITERIA

Potentially applicable Federal standards for remediation of ground water at the Medley Farm site include promulgated and proposed Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act (SWA). With regard to ground water, Table 5.2 has been included to provide a comparison of maximum concentrations of VOCs detected at the Medley Farm site with existing regulatory standards. Remediation standards for soils and ground water will be evaluated during the FS.

5.4 SOURCE CHARACTERIZATION

The results of organic compounds detected in source characterization analyses performed during the RI are presented on Table 5.3. Complete tables presenting the results of soil analyses conducted during the RI are included in Appendix L.

Analytical results of shallow soil samples collected from test pits during the source characterization indicate the presence of some residual chemicals in near surface soils of the source area at the site (Table 5.3). Ten test pits were excavated during Phase IA, as described in Section 3.3.1. Soil samples were collected and analyzed for TCL/TAL compounds from eight test pits (TP1, TP2, TP3, TP4, TP5, TP7, TP9 and TP10) as indicated in the approved Work Plan and POP. The eight samples were selected for analysis from test pits where the most evidence of former disposal activities were encountered, based upon visual assessment and field screening with an organic vapor

TABLE 5.2

3 10 0210

MEDLEY FARM SITE RI
POTENTIAL GROUND-WATER EVALUATION CRITERIA

<u>Compound</u>	<u>Maximum Conc. (mg/L)</u>	<u>Monitoring Well</u>	<u>Regulatory Standards (mg/L)</u>	<u>Source</u>
1,1-dichloroethene	0.440	BW2	0.007	MCL
1,2-dichloroethene	0.031	SW4	cis - 0.07 trans. 0.1	MCL MCL
1,1-dichloroethane	0.038	SW4	NA	
1,2-dichloroethane	0.290	BW2	0.005	MCL
trichloroethene	0.720	BW2	0.005	MCL
tetrachloroethene	0.200	SW3	0.005	MCL
1,1,1-trichloroethane	0.270	BW2	0.20	MCL
1,1,2-trichloroethane	0.013	SW4	0.005	MCL
Chloroform	0.010	BW2	0.10	MCL

MCL Safe Drinking Water Act
Maximum Contaminant Level

pMCL Safe Drinking Water Act
Proposed Maximum Contaminant Level

NA Not available

TABLE 5.3
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
ORGANIC COMPOUNDS DETECTED
IN
SOILS (ug/kg)

Page 1 of 8

SAMPLE ID COMPOUND	TP1-1	TP2-1	TP3-1	TP4-1	TP5-1	TP7-1	TP8-1	TP9-1	TP12-1	TP13-1	TP14-1	TP15-1
1,1-Dichloroethene			140 E	14								
1,1-Dichloroethane				47								
1,1,1-Trichloroethane				560 E								
1,1,2-Trichloroethane				71								
1,1,2,2-Tetrachloroethane				3400 E								
1,2-Dichloroethane									90			
1,2-Dichloroethene (total)			12000 E	730 E							250	
2-Butanone				81			1000					
4-Methyl-2-pentanone				16			390					
Acetone	12			2300 E			870	580 DE				
Benzene			600 E	160								
Carbon Disulfide			450 E									
Chlorobenzene			2500 E	360 E								
Ethylbenzene			1200 E	110							70	
Methylene Chloride				800 E						24	31	
Styrene				110								
Tetrachloroethene (PCE)			61000 E	5400 E					3 J		10	
Toluene			12000 E	1300 E							15	
Trichloroethene			12000 E	6600 E	8	280 D			31			16
Vinyl Acetate				13								
Vinyl Chloride			500 E								69	
Xylene (Total)		3.7	3900 E	620 E			170				250	

Data Flags:

D- Sample diluted for this analyte

E- Estimated result. Analyte concentration exceeded the instrument calibration range.

Notes:

No volatile organic compounds were detected in soil samples collected from test pits TP6, TP10, TP11, and TP16.

310 0211

TABLE 5.3 (continued)
 MEDLEY FARM SITE RI
 ANALYTICAL DATA SUMMARY
 ORGANIC COMPOUNDS DETECTED
 IN
 SOILS (ug/kg)

Page 2 of 8

SAMPLE ID COMPOUND	TP2-1	TP3-1	TP4-1	TP5-1	TP7-1
2-Methylnaphthalene	550				
1,2,4-Trichlorobenzene		710000 D	240000 D		
Acenaphthalene			75000		
Phenol			94000 D		
Bis(2-Ethylhexyl)phthalate				161000	630

Data Flags:

D - Sample diluted for this analyte.

Notes:

No semi-volatile organic compounds were detected in soil samples collected from test pits TP1 and TP9.

Soil samples collected from test pits TP6 and TP8 were not analyzed for semi-volatile organic compounds.

2010-02-12

TABLE 5.3 (continued)
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
ORGANIC COMPOUNDS DETECTED
IN
SOILS (ug/kg)

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1,1,2,2-TETRACHLOROETHANE

Sample Depth	Soil Boring Number		
	SB2	SB5	SB6
5 - 7'	*	nd	6
10 - 12'	710 D	nd	*
15 - 17'	97 D	9	nd
25 - 27'	74 D	nd	nd

METHYLENE CHLORIDE

Sample Depth	Soil Boring Number	
	SB3	SB4
5 - 7'	*	*
10 - 12'	50	10
15 - 17'	nd	32
25 - 27'	nd	17

CHLOROFORM

Sample Depth	Soil Boring Number	
	SB2	SB6
5 - 7'	*	13
10 - 12'	600 D	*
15 - 17'	nd	nd
25 - 27'	nd	nd

TRICHLOROETHENE

Sample Depth	Soil Boring Number	
	SB4	SB7
5 - 7'	*	24
10 - 12'	19	*
15 - 17'	32	nd
25 - 27'	17	nd

1,2-DICHLOROETHANE

Sample Depth	Soil Boring Number			
	SB4	SB7	SB9	SB10
5 - 7'	*	97	*	23
10 - 12'	3700 D	*	47	*
15 - 17'	4500 D	nd	32	nd
25 - 27'	680 D	nd	99	nd

Data Flags:

D - Sample diluted for this analyte.

E - Estimated result. Analyte concentration exceeded the instrument calibration range.

Notes:

nd - Not detected

* - Not analyzed.

2-Butanone was detected in boring SB2 at 15 - 17' at 90 ug/kg in the diluted sample.

1,2-Dichloroethene (total) was detected in boring SB3 at 10 - 12' at 17 ug/kg.

PCE was detected in boring SB7 at 5 - 7' at 12 ug/kg.

Results are reported only for borings in which analytes were detected. Complete tables of analytical results are provided in Appendix L.

310 0215

TABLE 5.3 (continued)
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
ORGANIC COMPOUNDS DETECTED
IN
SOIL (ug/kg)

Page 4 of 8

ACETONE

Sample Depth	Soil Boring Number			
	SB2	SB3	SB4	SB5
5 - 7'	*	*	*	nd
10 - 12'	18000 DE	140	200	21
15 - 17'	7300 DE	55	1900 D	570 D
25 - 27'	750 D	16	100	nd

ACETONE (continued)

Sample Depth	Soil Boring Number				
	SB6	SB7	SB8	SB9	SB10
5 - 7'	58	4700 D	86	*	31
10 - 12'	*	*	*	94	4
15 - 17'	nd	120	58	110	40
25 - 27'	nd	18	250 D	nd	65

Data Flags:

D- Sample diluted for this analyte.

E - Estimated result. Analyte concentration exceeded the instrument calibration range.

Notes:

nd - Not detected

* - Not analyzed

2-Butanone was detected in boring SB2 at 15 - 17' at 90 ug/kg in the diluted sample.

1,2-Dichloroethene (total) was detected in boring SB3 at 10 - 12' at 17 ug/kg.

PCE was detected in boring SB7 at 5 - 7' at 12 ug/kg.

Results are reported only for borings in which analytes were detected. Complete tables of analytical results are provided in Appendix L.

210 0214

TABLE 5.3 (continued)
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
ORGANIC COMPOUNDS DETECTED
IN
SOIL (ug/kg)

Page 5 of 8

1,2-DICHLOROBENZENE

Sample Depth	Soil Boring Number SB3
5 - 7'	*
10 - 12'	nd
15 - 17'	460
25 -27'	nd

NAPHTHALENE

Sample Depth	Soil Boring Number SB3
5 - 7'	*
10 - 12'	nd
15 - 17'	410
25 -27'	nd

PHENOL

Sample Depth	Soil Boring Number SB2
5 - 7'	*
10 - 12'	77000
15 - 17'	nd
25 -27'	690

1,4-DICHLOROBENZENE

Sample Depth	Soil Boring Number SB3
5 - 7'	*
10 - 12'	nd
15 - 17'	2300
25 -27'	nd

DIETHYLPHTHALATE

Sample Depth	Soil Boring Number SB3
5 - 7'	*
10 - 12'	nd
15 - 17'	nd
25 -27'	3200

BENZOIC ACID

Sample Depth	Soil Boring Number SB2
5 - 7'	*
10 - 12'	nd
15 - 17'	nd
25 -27'	2600

1,2,4-TRICHLOROBENZENE

Sample Depth	Soil Boring Number	
	SB2	SB3
5 - 7'	*	*
10 - 12'	nd	700
15 - 17'	nd	12000
25 -27'	5200	nd

Notes:

nd - Not detected

* - Not analyzed

Results are reported only for borings in which analytes were detected.
Complete tables of analytical results are provided in Appendix L.

310 0215

TABLE 5.3 (continued)
 MEDLEY FARM SITE RI
 ANALYTICAL DATA SUMMARY
 ORGANIC COMPOUNDS DETECTED
 IN
 SOILS (ug/kg) - See Note

SAMPLE I.D.	HA-1	HA-2	HA-3	HA-4	HA-5	HA-6	HA-7	HA-11	HA-6-A
PARAMETER									
1,1,2,2-Tetrachloroethane						91			85
1,1,2-Trichloroethane						160			110
1,2-Dichloroethene (total)	170	11		6			120		200
1,2-Dichloropropane							21		
Ethylbenzene				7				33	
Methylene chloride					6		23		
Styrene								11	
Tetrachloroethene					37	69			53
Trichloroethene	14					50	7		70
Vinyl chloride		25	25	28	210				

9120 012

TABLE 5.3 (continued)
 MEDLEY FARM SITE RI
 ANALYTICAL DATA SUMMARY
 ORGANIC COMPOUNDS DETECTED
 IN
 SOILS (ug/kg) - See Notes

SAMPLE I.D.	HA-6	HA-6 DILUTION	HA-11
PARAMETER			
1,2,4-Trichlorobenzene	990 @	1100 DJ	1200 @
bis(2-Ethylhexyl)phthalate	29000 E	33000 D	
Butylbenzylphthalate	900 @	1100 DJ	
Di-n-butylphthalate	930 @	1100 DJ	
Di-n-octylphthalate	5400	4900 D@	

Notes:

D - Sample diluted for this analyte.

J - Estimated result. Analyte detected at less than the sample quantitation limit.

E - Estimated result. Analyte concentration exceeded the instrument calibration range.

@ - Estimated result less than 5 times the detection limit.

TABLE 5.3 (continued)
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
ORGANICS DETECTED
IN
SOILS (ug/kg) - See Note

SAMPLE LOCATION	HA1	HA3	HA8	HA11
SAMPLE I.D.	HA1-2	HA3-2	HA8-2	HA11-2
PARAMETER				
Toxaphene	330			
PCB-1254		200	1900	430

analyzer. In addition to the eight sets of samples subjected to complete TCL/TAL analyses, samples collected from TP8 were subjected to VOC and pesticides/PCB analyses only. VOC analyses only were also performed on samples collected from TP6.

Six additional test pits (TP11 through TP16) were excavated for source area characterization during Phase IB field activities. Soil samples were also collected from these test pits and were analyzed for VOCs and SVOCs. As can be seen from the Table 5.3, residual chemicals detected in those soil samples were minimal.

5.4.1 Volatile Organic Compounds

VOCs were detected in samples collected from eight of the 10 Phase IA test pits (TP1, TP2, TP3, TP4, TP5, TP7, TP8 and TP9). VOCs detected at three of these locations (TP1, TP2, and TP5), consist of single compounds at trace levels. VOCs were detected in samples from test pits TP12, TP13, TP14, and TP15 excavated during Phase IB. Low concentrations of individual compounds were the only VOCs detected at test pits TP13 and TP15. VOCs were not detected in test pits TP6, TP10, TP11, or TP16. VOCs detected, excluding common laboratory artifacts, include vinyl chloride, carbon disulfide, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-dichloroethene, 1,1,1-trichloroethane, vinyl acetate, TCE, 1,1,2-trichloroethane, benzene, PCE, 1,1,2,2-tetrachloroethane, chlorobenzene, ethylbenzene, styrene, and xylene. Methylene chloride, 2-butanone, acetone, and toluene, listed as common laboratory artifacts, were also detected in test pit samples. The single highest VOC concentration detected was determined to be PCE (estimated at 61,000 $\mu\text{g}/\text{kg}$ in TP3).

5.4.2 Semi-Volatile Organic Compounds

Four SVOCs, acenaphthene, 2-methylnaphthalene, 1,2,4-trichlorobenzene, and phenol, were detected in Phase IA soil samples. Detected concentrations ranged from 550 $\mu\text{g/kg}$ (2-methylnaphthalene in TP2) to 710,000 $\mu\text{g/kg}$ (1,2,4-trichlorobenzene in TP3). No SVOCs were detected in soil samples collected from test pits during Phase IB.

5.4.3 Pesticides/PCBs

Several pesticide and PCB compounds were detected in test pit source characterization soil samples. Heptachlor epoxide and dieldrin, both pesticides, were detected in TP5 (21 $\mu\text{g/kg}$ heptachlor epoxide and 61 $\mu\text{g/kg}$ dieldrin) and TP10 (heptachlor epoxide at 46 $\mu\text{g/kg}$). The PCB compound Aroclor-1254 was detected in soil samples from TP1, TP2, TP5, TP7 and TP10. Aroclor - 1260 was detected at TP4 only at a concentration of 594 $\mu\text{g/kg}$. PCB concentrations detected ranged from 594 $\mu\text{g/kg}$ (Aroclor-1260 in TP4) to 5379 $\mu\text{g/kg}$ (Aroclor-1254 in TP2). The concentrations of PCBs detected in source characterization samples from the test pits are below TSCA recommended action level of 10 ppm.

5.4.4 Inorganics

Concentrations of most inorganics detected in soil samples from the source area at the site are well within published ranges of concentrations commonly occurring in natural soils. The Medley Farm site is located in an extremely variable metamorphic terrain where variability of inorganic concentrations in soil is expected to be high. Table 5.4 compares the concentrations of inorganics detected in soil samples collected from source area characterization test pits to typical ranges of inorganics reported in available references.

TABLE 5.4

COMPARISON OF INORGANIC CONCENTRATIONS (mg/kg) IN TEST PITS (PHASE IA)
AT THE MEDLEY FARM SITE WITH COMMONLY OCCURRING RANGES AND BACKGROUND SOILS

INORGANICS	PHASE IA TEST PITS								1 COMMON RANGE OF ELEMENTS IN SOIL - LINDSAY (1979)		2 ELEMENT CONC. IN EASTERN U.S. USGS (1984)	RANGE IN SITE SPECIFIC BACKGROUND SAMPLES SURFACE SOILS SOIL BORING SB1 HA-13, HA-14, HA-15	
	TP1	TP2	TP3	TP4	TP5	TP7	TP9	TP10	RANGE	AVERAGE			
Ag	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	0.01-5	0.05	-	BDL	BDL
Al	21,000(b)	13,700(b)	13,900(b)	10,300(b)	7830(b)	12,200(b)	20,200	16,300(b)	10,000-300,000	71,000	4.7%	19,000 - 33,300	24,400 - 66,800
As	30.6	9.8	20.2	19.8	BDL(a)	28.3	41.1	13.8	1-50	5	5.2	14.2 - 21.4	15.6 - 40.9
Ba	58	315	BDL(a)	BDL(a)	105	86.9	72.8	272	100-3,000	430	440	BDL - 98	44.6 - 95.8
Ca	BDL(a)	1040	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	7,000-500,000	13,700	0.92%	BDL	BDL-1030
Cd	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	0.01-0.70	0.06	-	BDL - 1.3	BDL
Co	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	1-40	8	6.7	BDL - 13	BDL - 14.6
Cr	6.2	9.3	BDL(a)	7.6	6.8	7.3	7.4	6.1	1-1,000	100	37	BDL - 10	3.5 - 12.6
Cu	BDL(a)	10.9	7.9	8.7	5.2	10.8	9.2	15.9	2-100	30	17	9.6 - 16	BDL - 39.1
Fe	26,500(b)	17,400(b)	9450(b)	10,500(b)	6560(b)	10300(b)	13,200	18,400(b)	7,000-550,000	38,000	1.8%	16,000 - 23,500	22,200 - 34,700
Hg	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	0.01-0.30	0.03	0.058	BDL	BDL
K	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	200-5,000	600	1.5%	1,090 - 4,190	BDL - 1350
Mg	BDL(a)	BDL(a)	324	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	600-6,000	5,000	0.44%	1,480 - 5,610	1370 - 2380
Mn	77(b)	152(b)	75.5(b)	86.8(b)	214(b)	242(a)	133	137(b)	20-3,000	600	330	94.7 - 1,060	99.9 - 302
Na	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	BDL(a)	750-7,500	6,300	0.59%	BDL	BDL
Ni	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(a)	BDL(c)	5-500	40	13	BDL	BDL
Pb	14.3	6.9	27.4	35	27.4	21.2	23.6	21.3	2-200	10	16	17.7 - 19.8	12.2 - 20.1
Sb	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	-	-	0.48	BDL - 34.3	10.7 - 24.9
Se	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	0.43	BDL(a)	0.1-2	0.3	0.26	BDL	BDL
Ti	BDL(c)	BDL(a)	BDL(c)	BDL(c)	3.5	BDL(c)	BDL(c)	BDL(c)	-	-	-	BDL	BDL
V	42.8	25.2	18.4	19.8	14.2	20.7	27.6	30.7	20-500	100	58	23.2 - 38.1	47.3 - 102
Zn	25	124	12.6	16.8	20.1	31.8	34.4	67.3	10-300	50	48	23.6 - 65.4	32.5 - 48.1
Cyanide	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	BDL(c)	1	0.66	-	-	-	-	-

a Below Contract Required Detection Limits

b Estimated Result

c Below Instrument Detection Limit

References:

1. Lindsay, W., 1979. Chemical Equilibrium in Soils. New York: John Wiley and Sons.

2. Shacklette, H.T. and J.G. Boerngen, 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270

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5.5 Surface Soils Analyses

Surface soil samples collected from fifteen locations (HA1 through HA15) during the RI (Phase II) were analyzed for VOCs, SVOCs, and pesticides/PCBs. Surface soil sampling locations HA1 through HA12 are within the limits of the former disposal area. Sampling locations HA13, HA14, and HA15 are located outside the limits of the former disposal area, in areas anticipated to be un-impacted by site activities. One additional surface soil sampling (HA16) was collected within the limits of the former disposal area and analyzed for SVOCs. Seven surface soil samples (HA4, HA8, HA9, HA10, HA13, HA14, and HA15) were analyzed for inorganics. Analytical results for the surface soil samples are summarized in Tables 5.3 (organics) and 5.5 (inorganics).

5.5.1 Volatile Organic Compounds

VOCs were detected in surface soil samples HA1 through HA7 and HA11. Vinyl chloride was the VOC detected at the highest concentration in any sample (210 ug/kg in HA5). Vinyl chloride was also detected in soil samples from HA2, HA3, and HA4. 1,2-dichloroethane was the VOC detected most often in surface soil samples, reported at concentrations ranging from 6 ug/kg in HA4 to 170 ug/kg in HA1. Other VOCs detected in surface soil samples include 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, ethylbenzene, methylene chloride, styrene, tetrachloroethene, and trichloroethene.

5.5.2 Semi-Volatile Organic Compounds

SVOCs were detected in surface soil samples, collected from locations HA6 and HA11. Compounds detected included 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, di-n-butylphthalate, and di-n-octylphthalate.

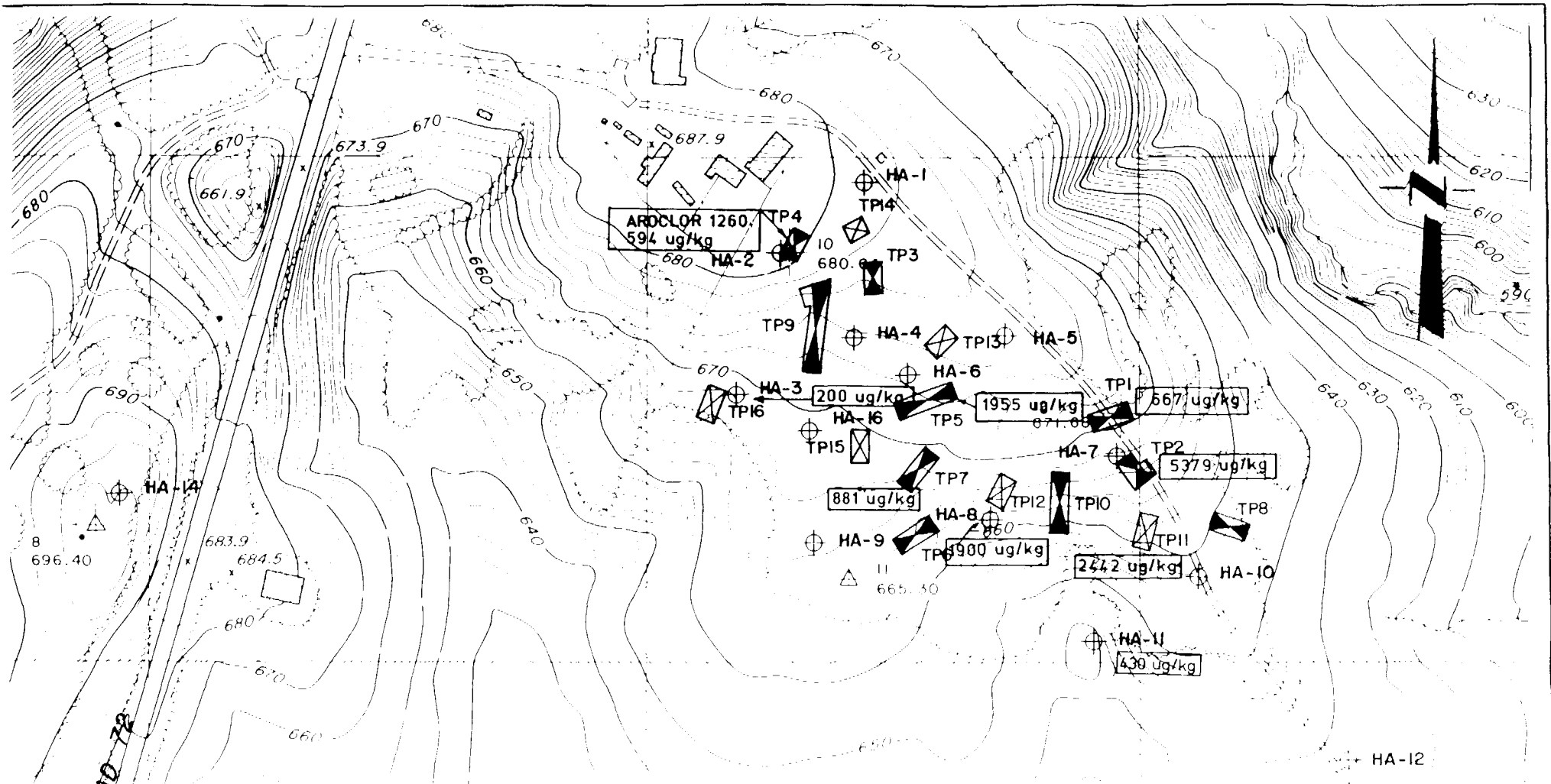
5.5.3 PCBs/Pesticides


The concentrations of PCBs detected in soils are well below the TSCA recommended action level. The distribution of PCBs detected in surface soil samples and source characterization samples is illustrated in Figure 5.1. PCB-1254 was detected in three surface soil samples (from locations HA3, HA8, HA11) at concentrations ranging from 200 to 1900 ug/kg. Toxaphene was detected in a single sample (330 ug/kg from location HA1).


5.5.4 Inorganic Constituents


Concentrations of inorganic constituents analyzed in surface soil samples are presented in Table 5.5. Sample locations HA4, HA8, HA9, and HA10 were selected to be inside the limits of the former disposal area. Sample locations HA13, HA14, and HA15 were selected to be in areas not expected to be impacted by site operations.

In general, concentrations of inorganic constituents detected in the surface soil samples occur within the common range of elements reported for natural soils in the eastern United States (compare results presented in Table 5.5 with ranges presented on Table 5.4). Additionally, a comparison of inorganic concentrations in soil samples collected from within the former disposal area (samples from HA4, HA8, HA9, and HA10), with inorganic concentrations observed in background soil samples collected from outside the former disposal area (HA13, HA14, and HA15), yields no indication of inorganic contamination. For most inorganic constituents, the concentrations observed within the former disposal area are lower than the maximum concentrations observed outside the former disposal area. Where concentrations within the former disposal area are greater than the maximum observed outside the former disposal area (as is observed for barium, chromium, cobalt, lead, manganese, nickel, potassium, and zinc), concentrations observed in both areas are within the same order of magnitude and none exceed common ranges reported for natural soils.



 Location and Extent of Test Pits Excavated During RI-Phase IA (Feb.-Mar. 1989)

 Location and Extent of Test Pits Excavated During RI-Phase IB (Dec. 1989)

 Hand Auger Surface Soil Sampling Location

100 0 100 200
SCALE 1"=100'
CONTOUR INTERVAL 2'

SIRRIE
ENVIRONMENTAL
CONSULTANTS
Greenville, South Carolina

Concentrations of PCB's in Soil

Medley Farms Site
Gaffney, South Carolina

Figure 5.1

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TABLE 5.5
MEDLEY FARM SITE RI
COMPARISON OF INORGANIC CONCENTRATIONS (mg/kg)
IN
SURFACE SOILS - See Notes

SAMPLE I.D.	HA-4	HA-8	HA-9	HA-10	HA-13	HA-14	HA-15
PARAMETER							
Aluminum	29600	19800	48600	37100	24400	66800	33700
Antimony	BDL (a)	BDL (c)	BDL (a)	BDL (c)	14.7	24.9	10.7
Arsenic	21.6	15	29	28.8	15.6	40.9	25.3
Barium	134	89.1	96.8	89.1	44.6	95.8	77.9
Beryllium	BDL (a)	BDL (a)	BDL (a)	BDL (a)	BDL (a)	BDL (a)	BDL (a)
Cadmium	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)
Calcium	BDL (a)	BDL (a)	BDL (a)	BDL (a)	1030	BDL (a)	BDL (a)
Chromium	16.4	11.2	11.8	12	3.5	10.1	12.6
Cobalt	16.1 (b)	BDL (a)	BDL (a)	BDL (a)	BDL (a)	BDL (a)	14.6 (b)
Copper	9.6	11.2	27.1	19.6	BDL (a)	37.8	39.1
Iron	20800	18200	26400	24200	22200	30000	34700
Lead	34.9	15.6	25.8	12.8	12.2	13.3	20.1
Magnesium	994	BDL (a)	1030	BDL (a)	2380	1400	1370
Manganese	590	343	225	87.6	190	99.9	302
Mercury	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)
Nickel	6.8	BDL (a)	7.1	BDL (a)	BDL (a)	BDL (a)	BDL (a)
Potassium	1450	934	1710	1600	BDL (a)	1350	BDL (a)
Selenium	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)
Silver	BDL (a)	BDL (c)	BDL (a)	BDL (a)	BDL (a)	BDL (a)	BDL (c)
Sodium	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)
Thallium	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (c)	BDL (a)	BDL (c)
Vanadium	39.6	34.1	46.7	48.6	47.3	54.8	102
Zinc	37.6 (b)	54.4 (b)	74 (b)	30.9 (b)	48.1 (b)	42.2 (b)	32.5 (b)

Notes:

- (a) Below contract required detection limits.
- (b) Estimated result.
- (c) Below sample detection limit.

5.6 Subsurface Soils

Ten soil borings were drilled during Phase IB field assessment activities. A total of 30 soil boring samples were collected and analyzed for VOCs and SVOCs. In addition, soil samples were collected from a soil boring (SB1) drilled at a selected background location. Background samples were analyzed for pesticides and inorganic compounds only. The background boring was located approximately 350 feet from the suspected disposal site, in front of the Medley household. The soil boring locations are shown on Figure 3.3.

5.6.1 Volatile Organic Compounds

VOCs were detected in all of the soil borings except the background soil boring (SB1) where VOC analyses were not performed. The most notable occurrences of VOCs are: 1,1,2,2-tetrachloroethane (710 ug/kg) at SB2; 1,2-dichloroethane ranging from 680 to 4500 ug/kg at SB4; and acetone at SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9 and SB10 at concentrations ranging from 4 to 18,000 ug/kg. Acetone and 1,2-dichloroethane are the VOCs detected at the highest concentrations in soil samples collected from the borings. Low levels of TCE were detected in soil samples collected from borings SB4 and SB7. Isolated occurrences of PCE, 1,2-dichloroethene and 2-butanone were also detected at low levels as indicated on Table 5.3. The highest concentrations of VOCs were observed at SB2 and SB4 which were drilled at sites where former lagoons appear to have been located. This data agrees well with test pit observations and analytical results. No pattern of VOC distribution with depth was noted. Although soil samples collected from below a depth of 27 feet were not subjected to chemical analyses, the overall distribution of VOCs in soil and ground water indicate that VOCs are present immediately beneath concentrated source areas (lagoons and drum storage areas) throughout the entire vadose zone.

5.6.2 Semi-Volatile Organic Compounds

SVOCs, excluding common laboratory artifacts, were detected in only two soil borings (SB2, and SB3). These borings were located at former lagoon sites where residual waste materials were encountered in test pits (TP3 and TP4). SVOCs detected include phenol, 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, benzoic acid, and naphthalene. SVOC concentrations ranged from 410 $\mu\text{g/kg}$ (naphthalene in SB3 at the 15.0 - 17.0 foot depth) to 77,000 $\mu\text{g/kg}$ (phenol in SB2 at the 10.0 - 12.0 foot depth). Bis (2-ethylhexyl) phthalate was observed in analyses from six of the soil borings; however, inspection of laboratory blank analytical data indicate that this compound is a laboratory artifact and therefore this compound is not included on the analytical data summary, Table 5.3.

5.6.3 Inorganic Constituents

Analyses for TAL inorganic compounds (except cyanide) were also performed on samples from the background boring, SB1. Table 5.6 compares the inorganic analytical results from SB1 with commonly reported concentrations of inorganics present in natural soils. Table 5.6 illustrates that the background concentrations of most inorganic compounds detected in samples from SB1 are within commonly reported ranges for natural soils in the eastern United States. This is consistent with the results of analyses performed on surface soil samples.

5.6.4 Other Constituents

Although there was no indication that dioxins were stored or disposed of at the site, one composite soil sample was collected and analyzed for dioxins as required by EPA. The analytical results indicate that dioxin is not present at the site. Soil samples composited

TABLE 5.6

**COMPARISON OF BACKGROUND CONCENTRATIONS (mg/kg) OF INORGANICS IN SOIL BORINGS
AT THE MEDLEY FARM SITE WITH COMMONLY OCCURRING RANGES**

INORGANICS	BACKGROUND SOIL SAMPLES (Soil Boring SB1)			COMMON RANGE OF ELEMENTS IN SOIL - LINDSAY (1979)		
	SB1-S1 (5-7 ft.)	SB1-S3 (15-17 ft.)	SB1-S5 (25-27 ft.)	<u>RANGE</u>	<u>SELECTED AVERAGE</u>	<u>ELEMENT CONC. IN SOILS - EASTERN U.S. - USGS (1984)</u>
Ag	BDL (c)	BDL (c)	BDL (c)	0.01-5	0.05	-
Al	33,300	19,300	28,700	10,000-300,000	71,000	4.7%
As	17.6	14.2	21.4	1-50	5	5.2
Ba	BDL (a)	54.7	98	100-3,000	430	440
Be	BDL (a)	BDL (a)	1.3	0.1-40	6	0.63
Ca	BDL (a)	BDL (a)	BDL (a)	7,000-500,000	13,700	0.92%
Cd	BDL (a)	1.1	1.3	0.01-0.70	0.06	-
Co	BDL (a)	BDL (a)	13	1-40	8	6.7
Cr	10	5	BDL (a)	1-1,000	100	37
Cu	16 (b)	9.6 (b)	11.4 (b)	2-100	30	17
Fe	23,400	16,000	23,500	7,000-550,000	38,000	1.8%
Hg	BDL (c)	BDL (c)	BDL (c)	0.01-0.30	0.03	0.058
K	1,560	1,090	4,190	200-5,000	600	1.5%
Mg	1,480	1,870	5,610	600-6,000	5,000	0.44%
Mn	94.7	247	1,060	20-3,000	600	330
Na	BDL (c)	BDL (c)	BDL (c)	750-7,500	6,300	0.59%
Ni	BDL (a)	BDL (a)	BDL (a)	5-500	40	13
Pb	17.7	19.8	18.7	2-200	10	16
Sb	34.3	23.7	BDL (a)	-	-	0.48
Se	BDL (c)	BDL (c)	BDL (c)	0.1-2	0.3	0.26
Tl	BDL (c)	BDL (c)	BDL (c)	-	-	-
V	38.1(b)	23.2 (b)	23.4 (b)	20-500	100	58
Zn	23.6	25.4	65.4	10-300	50	48

a Below Contract Required Detection Limits.

b Estimated Result.

c Below Instrument Detection Limit.

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for dioxin analysis were collected from soil borings SB2 and SB5, drilled at the locations where test pits TP2 and TP4 were excavated. Samples collected for dioxin analysis were taken from the natural soils immediately underlying the fill materials which may have been placed during the EPA emergency response action. Logs of test pits TP2 and TP4 were used to determine appropriate sampling intervals. These two soil samples were composited and the composite soil sample was analyzed for dioxins by CLP Special Analytical Services. Dioxin sampling locations were based on the presence of dioxin-related semi-volatile organic compounds detected in Phase IA test pit soils analyses.

Although these compounds were observed at four test pit locations, test pits TP2 and TP4 were selected over test pits TP3 and TP9 as dioxin screening locations for the following reasons: 1) trace levels (below Sample Quantitation Limits (SQLS)) of pentachlorophenol, a potential dioxin precursor compound, was detected in samples TP2-1; and TP9-1. Since Aroclor 1254, another potential dioxin precursor was also detected in TP2-1, TP2 was selected as one of the dioxin sampling locations. Several dioxin related semi-volatile organic compounds were detected at low levels in TP4-1, because only one dioxin related compound was detected in TP3-1, TP4 was selected as the second dioxin sampling location.

5.7 GROUND WATER ANALYSES

A summary of organic and inorganic ground water analyses completed during the Medley RI are presented on Tables 5.7, 5.8 and 5.9. Chemical analyses of ground-water samples collected during the RI revealed the presence of site-related VOCs in the saprolite and bedrock aquifers. No SVOCs, pesticides or PCBs were detected in any of the ground-water analyses. Complete tables presenting the results of ground water analyses conducted during the RI are included in Appendix L.

TABLE 5.7
MEDLEY FARM SITE RI - ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE QUANTITATION LIMITS
IN GROUND WATER (ug/l), PHASE IA, PHASE IB, AND PHASE II (See Notes)

SAMPLE LOCATION	BW1		SW1	BW2			SW3
SAMPLE I.D.	*BW1-3	BW1-4	SW1-4	BW2-1	BW2-2	BW2-3	SW3-1
SAMPLE DATE	09-28-90	11-27-90	11-27-90	08-09-89	01-10-90	09-28-90	08-08-89
PHASE	PHASE II	PHASE II (Resample)	PHASE II (Resample)	PHASE IA	PHASE IB	PHASE II	PHASE IA
PARAMETER							
Acetone	19		5 BJ			18	
Benzene							
Carbon tetrachloride							
Chloroform					10		
Chloromethane							
Methylene chloride		4 BJ	3 BJ	110 D			
Tetrachloroethene				35 D	18	8	190
Toluene							
Trichloroethene				720 D	530 D	140	140
1,1,2,2-Tetrachloroethane							
1,1,1-Trichloroethane				310 D	270 D	110	
1,1,2-Trichloroethane							
1,1-Dichloroethene				440 D	340 D	130	8
1,2-Dichloroethene (total)							9
1,1-Dichloroethane							
1,2-Dichloroethane				290 D	260 D	120	
2-Butanone							
2-Hexanone							

Notes:

- 1) No volatile organic compounds were detected above quantitation limits in samples BW4-1, SW1-1, BW1-1, BW3-1, BW4-2, BW110-3, SW106-1, SW102-3, SW104-3, and SW109-3. Compounds identified as common laboratory contaminants in EPA guidance were considered to be present in a sample only if the reported concentration was greater than 10 times the concentration reported in any laboratory blank (see Section 5.10.2 for discussion of data validation) in accordance with EPA guidance.
- D- Sample diluted for this analyte.
- E- Estimated result. Analyte concentration exceeded the instrument calibration range.
- B- Analyte detected in the associated blank. Result not corrected.
- J- Estimated result. Analyte detected at less than the sample quantitation limit. Constituents detected at less than quantitation limits are reported only for analytical results of BW1-4, SW1-4, BW4-4, and SW106-4 for comparison to initial Phase II results at these locations.
- * Raw data results for BW1-3, SW1-2, BW4-3 and SW106-3 were inconsistent with concentrations previously reported. These wells were subsequently resampled (Nov. 26 and 27, 1990) and samples were submitted to Ecotek Laboratory for analysis. The Ecotek results are indicated by the 'Resample' designation.

TABLE 5.7
MEDLEY FARM SITE RI - ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE QUANTITATION LIMITS
IN GROUND WATER (ug/l), PHASE IA, PHASE IB, AND PHASE II (See Notes)

SAMPLE LOCATION	SW3		BW4		SW4		
SAMPLE I.D.	SW3-2	SW3-3	*BW4-3	BW4-4	SW4-1	SW4-2	SW4-3
SAMPLE DATE	01-09-90	09-25-90	09-26-90	11-26-90	08-08-89	01-09-90	09-25-90
PHASE	PHASE IB	PHASE II	PHASE II	PHASE II (Resample)	PHASE IA	PHASE IB	PHASE II
PARAMETER							
Acetone							
Benzene							
Carbon tetrachloride			130				
Chloroform			74				
Chloromethane	15						
Methylene chloride			4 BJ				
Tetrachloroethene	200	190					
Toluene			9.5				
Trichloroethene	130	190	49				
1,1,2,2-Tetrachloroethane			19				
1,1,1-Trichloroethane	5.6				3400 D	2800 E	2500 D
1,1,2-Trichloroethane			18	8		13	
1,1-Dichloroethene					1800 D	2100 E	2200 D
1,2-Dichloroethene (total)	5.4				31		
1,1-Dichloroethane					120	38	
1,2-Dichloroethane			13				
2-Butanone							
2-Hexanone							

Notes:

- 1) No volatile organic compounds were detected above quantitation limits in samples BW4-1, SW1-1, BW1-1, BW3-1, BW4-2, BW110-3, SW106-1, SW102-3, SW104-3, and SW109-3. Compounds identified as common laboratory contaminants in EPA guidance were considered to be present in a sample only if the reported concentration was greater than 10 times the concentration reported in any laboratory blank (see Section 5.10.2 for discussion of data validation) in accordance with EPA guidance.
- D- Sample diluted for this analyte.
- E- Estimated result. Analyte concentration exceeded the instrument calibration range.
- B- Analyte detected in the associated blank. Result not corrected.
- J- Estimated result. Analyte detected at less than the sample quantitation limit. Constituents detected at less than quantitation limits are reported only for analytical results of BW1-4, SW1-4, BW4-4, and SW106-4 for comparison to initial Phase II results at these locations.
- * Raw data results for BW1-3, SW1-2, BW4-3 and SW106-3 were inconsistent with concentrations previously reported. These wells were subsequently resampled (Nov. 26 and 27, 1990) and samples were submitted to Ecotek Laboratory for analysis. The Ecotek results are indicated by the 'Resample' designation.

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TABLE 5.7
MEDLEY FARM SITE RI - ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE QUANTITATION LIMITS
IN GROUND WATER (ug/l), PHASE IA, PHASE IB, AND PHASE II (See Notes)

SAMPLE LOCATION	SW101	BW105			BW106	SW106	
SAMPLE I.D.	SW101-3	BW105-1X	BW105-1Z	BW105-3	BW106-1	*SW106-3	SW106-4
SAMPLE DATE	09-26-90	09-19-90	09-18-90	10-15-90	09-28-90	09-27-90	11-26-90
PHASE	PHASE II	PHASE II	PHASE II	PHASE II	PHASE II	PHASE II	PHASE II (Resample)
PARAMETER							
Acetone						160	5 BJ
Benzene		95		11			
Carbon tetrachloride							
Chloroform							
Chloromethane		110					
Methylene chloride							4 BJ
Tetrachloroethene							
Toluene						91	
Trichloroethene							
1,1,2,2-Tetrachloroethane							
1,1,1-Trichloroethane	7	90	80	9	5.2	9.3	
1,1,2-Trichloroethane							
1,1-Dichloroethene		27	39				
1,2-Dichloroethene (total)							
1,1-Dichloroethane							
1,2-Dichloroethane							
2-Butanone					13	170	
2-Hexanone						14	

Notes:

- 1) No volatile organic compounds were detected above quantitation limits in samples BW4-1, SW1-1, BW1-1, BW3-1, BW4-2, BW110-3, SW106-1, SW102-3, SW104-3, and SW109-3. Compounds identified as common laboratory contaminants in EPA guidance were considered to be present in a sample only if the reported concentration was greater than 10 times the concentration reported in any laboratory blank (see Section 5.10.2 for discussion of data validation) in accordance with EPA guidance.
- D- Sample diluted for this analyte.
- E- Estimated result. Analyte concentration exceeded the instrument calibration range.
- B- Analyte detected in the associated blank. Result not corrected.
- J- Estimated result. Analyte detected at less than the sample quantitation limit. Constituents detected at less than quantitation limits are reported only for analytical results of BW1-4, SW1-4, BW4-4, and SW106-4 for comparison to initial Phase II results at these locations.
- * Raw data results for BW1-3, SW1-2, BW4-3 and SW106-3 were inconsistent with concentrations previously reported. These wells were subsequently resampled (Nov. 26 and 27, 1990) and samples were submitted to Ecotek Laboratory for analysis. The Ecotek results are indicated by the 'Resample' designation.

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TABLE 5.7
MEDLEY FARM SITE RI - ANALYTICAL DATA SUMMARY
VOLATILE ORGANIC COMPOUNDS DETECTED ABOVE QUANTITATION LIMITS
IN GROUND WATER (ug/l), PHASE IA, PHASE IB, AND PHASE II (See Notes)

Page 4 of 4

SAMPLE LOCATION	BW108	SW108	BW109
SAMPLE I.D.	BW108-3	SW108-3	BW109-3
SAMPLE DATE	10-02-90	09-25-90	10-15-90
PARAMETER			
Acetone			
Benzene			
Carbon tetrachloride			
Chloroform			6
Chloromethane		26	
Methylene chloride			
Tetrachloroethene	230	30	
Toluene			
Trichloroethene	380	45	
1,1,2,2-Tetrachloroethane			
1,1,1-Trichloroethane	15	13	6
1,1,2-Trichloroethane			
1,1-Dichloroethene	80	11	
1,2-Dichloroethene (total)	17		
1,1-Dichloroethane			
1,2-Dichloroethane	12		
2-Butanone			
2-Hexanone			

Notes:

- 1) No volatile organic compounds were detected above quantitation limits in samples BW4-1, SW1-1, BW3-1, BW4-2, BW110-3, SW106-1, SW102-3, SW104-3, and SW109-3. Compounds identified as common laboratory contaminants in EPA guidance were considered to be present in a sample only if the reported concentration was greater than 10 times the concentration reported in any laboratory blank (see Section 5.10.2 for discussion of data validation) in accordance with EPA guidance.
- D- Sample diluted for this analyte.
- E- Estimated result. Analyte concentration exceeded the instrument calibration range.
- B- Analyte detected in the associated blank. Result not corrected.
- J- Estimated result. Analyte detected at less than the sample quantitation limit. Constituents detected at less than quantitation limits are reported only for analytical results of BW1-4, SW1-4, BW4-4, and SW106-4 for comparison to initial Phase II results at these locations.
- * Raw data results for BW1-3, SW1-2, BW4-3 and SW106-3 were inconsistent with concentrations previously reported. These wells were subsequently resampled (Nov. 26 and 27, 1990) and samples were submitted to Ecotek Laboratory for analysis. The Ecotek results are indicated by the 'Resample' designation.

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TABLE 5.8
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
METALS DETECTED
IN
GROUND WATER (ug/l) - See Notes
SAPROLITE WELLS

					EPA Drinking Water Regulations	
SAMPLE LOCATION	SW1		SW3	SW4	Promulgated MCLs (ug/l)	Proposed MCLs (ug/l)
SAMPLE I.D.	SW1-01	SW1-02	SW3-01	SW4-01		
PARAMETER						
Aluminum, total	189000	12900	11800	41400	.	.
Aluminum, dissolved						
Antimony, total	492	BDL (c)	BDL (c)	BDL (c)	.	10/5 (g)
Antimony, dissolved						
Arsenic, total	65.6	BDL (b)	BDL (c)	BDL (c)	50 (d)	.
Arsenic, dissolved						
Barium, total	1690	BDL (b)	BDL (b)	592	1000 (d)	2000 (h)
Barium, dissolved						
Beryllium, total	14.2	BDL (c)	BDL (b)	6	.	1 (g)
Beryllium, dissolved						
Cadmium, total	7	BDL (c)	BDL (c)	BDL (c)	5 (i)	.
Cadmium, dissolved						
Calcium, total	34100	BDL (b)	8490	18500	.	.
Calcium, dissolved						
Chromium, total	97.8	BDL (b)	12.7	20.8	100 (i)	.
Chromium, dissolved						
Cobalt, total	183	BDL (b)	BDL (b)	BDL (b)	.	.
Cobalt, dissolved						
Copper, total	307	BDL (b)	45.2	BDL (c)	1000 (e)	1300 (f)
Copper, dissolved						
Iron, total	266000	17900	14600	24.3	300 (e)	.
Iron, dissolved						
Lead, total	45.8	4.8	5.3	24.3	50 (d)	(15) (j)
Lead, dissolved						
Magnesium, total	143000	9390 (a)	6150	24300	.	.
Magnesium, dissolved						
Manganese, total	10700	727	794	3210	50 (e)	.
Manganese, dissolved						
Mercury, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	2 (d)	.
Mercury, dissolved						
Nickel, total	116	BDL (c)	BDL (c)	BDL (b)	.	100 (g)
Nickel, dissolved						
Potassium, total	105000	7690	6180	9100	.	.
Potassium, dissolved						
Selenium, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	50 (i)	.
Selenium, dissolved						
Silver, total	BDL (c)	BDL (c)	20.2	BDL (c)	50 (d)	.
Silver, dissolved						
Sodium, total	BDL (b)	9730	9930	12600	.	.
Sodium, dissolved						
Thallium, total	BDL (b)	BDL (c)	BDL (c)	BDL (c)	.	2/1 (g)
Thallium, dissolved						
Vanadium, total	305	BDL (b)	BDL (b)	72.3	.	.
Vanadium, dissolved						
Zinc, total	1290	92.5	19 (a)	884 (a)	5000 (e)	.
Zinc, dissolved						

- Notes
- (a) Estimated result
 - (b) Below contract required detection limit
 - (c) Below instrument detection limit.
 - (d) Primary Maximum Contaminant Level (MCL)
 - (e) Secondary MCL for public water systems
 - (f) Federal Register, August 18, 1988
 - (g) Federal Register, July 25, 1989
 - (h) Federal Register, January 30, 1991
 - (i) Federal Register, January 30, 1991 (effective date July 30, 1992)
 - (j) Superfund cleanup level

TABLE 5.9
MEDLEY FARM SITE RI
ANALYTICAL DATA SUMMARY
METALS DETECTED
IN
GROUND WATER (ug/l) - See Notes
BEDROCK WELLS

3 10 0235

					EPA Drinking Water Regulations	
SAMPLE LOCATION	BW1		BW2	BW4	Promulgated	Proposed
SAMPLE I.D.	BW1-1	BW1-3	BW2-1	BW4-1	MCLs (ug/l)	MCLs (ug/l)
PARAMETER						
Aluminum, total	1730	395	500	5570	•	•
Aluminum, dissolved		BDL (b)				
Antimony, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	•	10/5 (g)
Antimony, dissolved		BDL (c)				
Arsenic, total	BDL (b)	BDL (c)	BDL (c)	BDL (c)	50 (d)	•
Arsenic, dissolved		12.2				
Barium, total	BDL (b)	BDL (b)	BDL (b)	BDL (b)	1000 (d)	2000 (h)
Barium, dissolved		BDL (b)				
Beryllium, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	•	1 (g)
Beryllium, dissolved		BDL (c)				
Cadmium, total	BDL (c)	BDL (c)	10	BDL (c)	5 (i)	•
Cadmium, dissolved		BDL (c)				
Calcium, total	9690	6990	7300	32200	•	•
Calcium, dissolved		6770				
Chromium, total	BDL (b)	BDL (c)	BDL (c)	BDL (b)	100 (i)	•
Chromium, dissolved		BDL (b)				
Cobalt, total	BDL (b)	BDL (c)	BDL (c)	BDL (b)	•	•
Cobalt, dissolved		BDL (c)				
Copper, total	BDL (b)	BDL (c)	BDL (c)	BDL (c)	1000 (e)	1300 (f)
Copper, dissolved		BDL (b)				
Iron, total	1900	613	870	3410	300 (e)	•
Iron, dissolved		BDL (b)				
Lead, total	5.8	4	BDL (b)	BDL (c)	50 (d)	(15) (j)
Lead, dissolved		BDL (b)				
Magnesium, total	BDL (b)	BDL (b)	BDL (b)	13400	•	•
Magnesium, dissolved		BDL (b)				
Manganese, total	59.7	BDL (b)	33	183	50 (e)	•
Manganese, dissolved		BDL (b)				
Mercury, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	2 (d)	•
Mercury, dissolved		BDL (c)				
Nickel, total	BDL (c)	BDL (c)	BDL (b)	BDL (c)	•	100 (g)
Nickel, dissolved		BDL (c)				
Potassium, total	BDL (b)	BDL (b)	BDL (b)	BDL (c)	•	•
Potassium, dissolved		BDL (b)				
Selenium, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	50 (i)	•
Selenium, dissolved		BDL (c)				
Silver, total	BDL (b)	BDL (c)	BDL (c)	BDL (c)	50 (d)	•
Silver, dissolved		BDL (b)				
Sodium, total	10700	9000	8400	12900	•	•
Sodium, dissolved		9100				
Thallium, total	BDL (c)	BDL (c)	BDL (c)	BDL (c)	•	2/1 (g)
Thallium, dissolved		BDL (c)				
Vanadium, total	BDL (b)	BDL (b)	BDL (c)	BDL (b)	•	•
Vanadium, dissolved		BDL (b)				
Zinc, total	BDL (b)	BDL (b)	110	38.7 (a)	5000 (e)	•
Zinc, dissolved		BDL (b)				

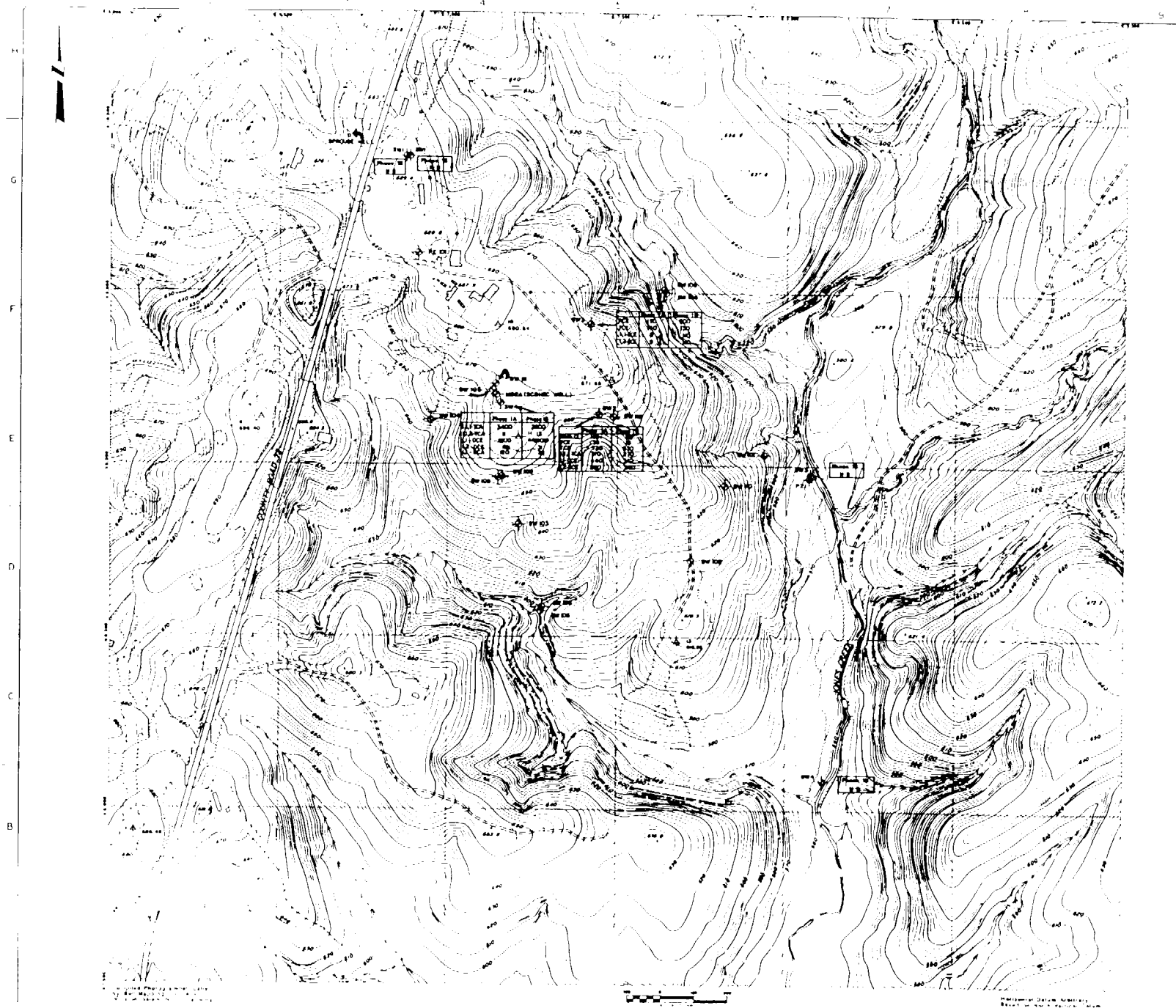
- Notes:
- (a) Estimated result.
 - (b) Below contract required detection limit.
 - (c) Below instrument detection limit.
 - (d) Primary Maximum Contaminant Level (MCL)
 - (e) Secondary MCL for public water systems
 - (f) Federal Register, August 18, 1988
 - (g) Federal Register, July 25, 1990
 - (h) Federal Register, January 30, 1991
 - (i) Federal Register, January 30, 1991 (effective date July 30, 1992)
 - (j) Superfund cleanup level

5.7.1 Volatile Organic Compounds

VOCs were detected above CLP Sample Quantitation Limits (SQLs) in ground-water samples collected during the RI from monitoring wells BW2, SW3, SW4, SW101, BW105, BW106, BW108, SW108, and BW109. The primary VOCs detected in ground water samples collected during the RI include 1,1-dichloroethene, 1,2-dichloroethane, 1,1,1-trichloroethane, TCE, and PCE. Low concentrations of 1,1-dichloroethane, 1,2-dichloroethene, 1,1,2-trichloroethane, and methylene chloride were also detected during the RI. The highest concentrations of the primary individual volatile organic compounds detected were 2,200 ug/L 1,1-DCE at SW4 during Phase II, 290 ug/L 1,2-DCA at BW2 during Phase I, 200 µg/L PCE at well SW3 during Phase I, 3,400 µg/L 1,1,1-trichloroethane at well SW4 during Phase I, and 720 µg/L TCE at well BW2 detected during Phase I. The distribution of VOCs detected in ground water during Phase I of the RI is presented on Figure 5.2. The distribution of VOCs detected in ground water during Phase II of the RI is present on Figure 5.3.

Volatile organic compounds were reported to be present in the ground-water samples collected on September 26, 27, and 28, 1990 from wells SW1, BW1, BW4, and SW106 during Phase II of the RI. The results for SW1, BW1, and BW4 were inconsistent with analytical results reported for samples collected during Phase I. Additionally, the results reported for SW106 were inconsistent with results obtained early during the Phase II (laboratory results reported for sample SW106-1 collected 9/19/90). Therefore, these four wells were resampled on November 27 and 28, 1990, in order to confirm the Phase II reported results. Results of the resampling effort, presented in Table 5.7, are consistent with results reported during Phase I. These results are considered to be representative of the ground-water quality at these wells and confirm that VOCs are not present in these wells at concentrations above CRQLs.

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LEGEND

- HORIZONTAL CONTROL POINT
- VERTICAL CONTROL POINT
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- UPPER BOUND CONTOUR
- SPOT ELEVATION
- PILE
- WATER
- IMPROVED ROAD
- RAILROAD
- BOUNDARY
- LOCATED OBJECT
- POLE
- TRAIL
- BRUSH

NOTES

Ground Water Monitoring wells were installed from May to August 1991 by Southwestern Consulting and Services, Inc. at May Farm, SC, and used to monitor and report on ground water and seepage of May Farm, SC.

Surveying was completed by Southwestern Consulting and Services, Inc. at May Farm, SC, and used to monitor and report on ground water and seepage of May Farm, SC.

All data and notes are copyrighted by 1991.

SIGNATURE

DATE

SCALE

GRAPHIC TITLE

VOC CONCENTRATIONS IN GROUND WATER

PHASE IIIA AND III

PROJECT NUMBER

SIRRIE ENVIRONMENTAL CONSULTANTS

Greenville, South Carolina

May Farm Site

Greenville, South Carolina

Remedial Investigation

Feasibility Study

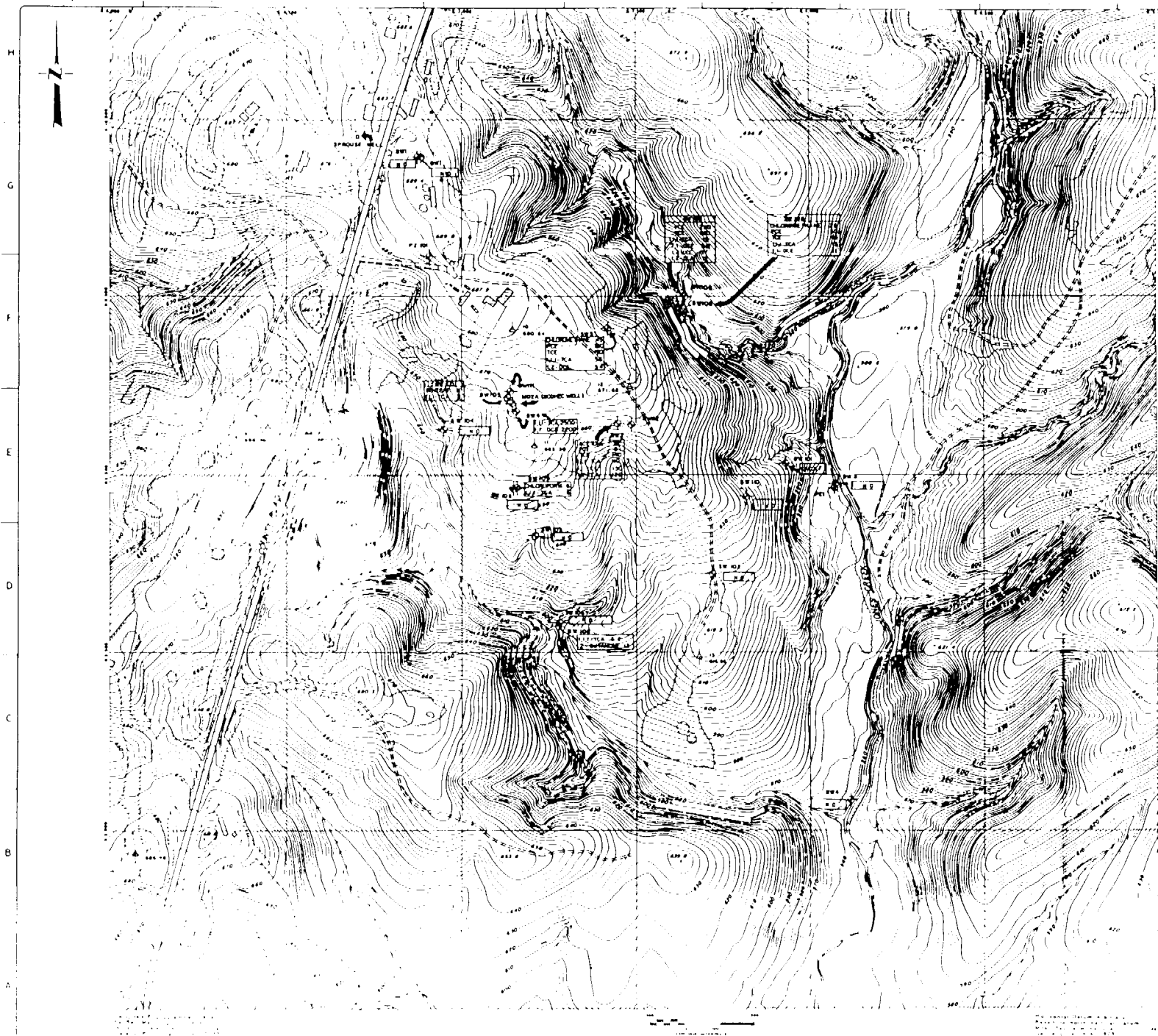
GRAPHIC TITLE

VOC CONCENTRATIONS IN GROUND WATER

PHASE IIIA AND III

PROJECT NUMBER

3, 10 U258



LEGEND

HORIZONTAL CONTROL POINT	▲
VERTICAL CONTROL POINT	●
INDEX CONTOUR	—
INTERMEDIATE CONTOUR	- - -
DEPRESSION CONTOUR	---v---
SPOT ELEVATION	•
WATER	~~~~~
UNIMPROVED ROAD	- - -
IMPROVED ROAD	==
RAILROAD	—+—+—+—
LOCATED OBJECT	□
ENCE	—x—x—x—
POLE	•
TREES	
SHRUBS	

Sample IDs for
Phase II Results Presented

Well	Sample ID
SW1	SW1-4
BW1	BW1-4
BW2	BW2-3
SW3	SW3-3
SW4	SW4-3
BW4	BW4-4
SW101	SW101-3
SW102	SW102-3
SW103	SW103-3
SW104	SW104-3
BW105	BW105-3
SW106	SW106-4
BW106	BW106-1
SW108	SW108-3
BW108	BW108-3
SW109	SW109-3
BW109	BW109-3
BW110	BW110-3

Surveyed Location of
Ground Water Monitoring
Well or Piezometer

NOTES
Ground water monitoring wells were installed from May to August 1988 by Environmental Drilling and Services, Inc. at Aberdeen, MD and August to October 1988 by Atlantic Test and Engineering at Atlanta, GA.

Surveying was completed by Bureau of Land Management, Charlotte, NC.
R 3 indicates no reliable ground water data collected above 100 ft below National Water Level Lineal.
All elevations are expressed in feet.

From results reported by wells SW1, SW2, SW3, and SW4.

SIGNATURE

DATE

SCALE
1" = 100'
1" = 200'
1" = 300'

SIRRIE
ENVIRONMENTAL
CONSULTANTS
Greenville, South Carolina

Marley Farm Site
Gaffney, South Carolina
Remedial Investigation
Feasibility Study

Prepared by: [Name]
Checked by: [Name]
Reviewed by: [Name]
Date: [Date]

Sheet 1 of 1

Discrete interval sampling was conducted at well BW105 as described in Section 3.9.4 (Phase II ground water sampling). Ground-water samples collected from discrete intervals in this well were identified using the following nomenclature:

<u>Sample No.</u>	<u>Interval Sampled</u>
BW105-1X	90.0 to 102.7
BW105-1Y	110.8 to 123.5
BW105-1Z	127.2 to 140.0

Sampling intervals are expressed as depth in feet below ground surface.

VOCs detected in BW105-1X included 1,1,1-trichloroethane at 90 ug/L, chloromethane at 110 ug/L, 1,1-dichloroethene at 27 ug/L, and benzene at 95 ug/L. Only one VOC, 1,1,1-trichloroethane, was detected in sample BW105-1Y, at an estimated concentration of 15 ug/L. Two VOCs (1,1,1-trichloroethane at 80 ug/L and 1,1-dichloroethene at 39 ug/L) were detected in sample BW105-1Z. Complete analytical results for the discrete interval sampling are presented on the second page (first data table) of Appendix L - Ground Water (Phase II).

5.7.2 Inorganic Constituents

A number of inorganic compounds were detected above SQLs in ground-water samples collected from wells SW1, SW3, SW4, BW1, BW2, and BW4 during the RI. These include silver, aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, chromium, cobalt, copper, iron, potassium, magnesium, manganese, nickel, sodium, lead, vanadium, and zinc. All of these metals occur naturally in ground water. Upgradient wells SW1 and BW1 were sampled and analyzed for metals in Phase IB and again during Phase II for an indication of background concentration of inorganics at the site. During Phase II, both filtered and unfiltered ground water samples were collected from wells BW1 and SW1 during the Phase

II ground water sampling event. The filtered sample from SW1 was broken at the analytical laboratory, however. Filtered and unfiltered samples from BW1 were analyzed for inorganics, but only the unfiltered sample from SW1 was analyzed.

No specific conclusions can be drawn from a comparison of the inorganic analytical results of the filtered versus unfiltered ground-water sample from well BW1. A qualitative evaluation of the turbidity of the unfiltered sample collected from SW1, however, indicates that suspended solids present in the water would contribute to the total inorganics present in the sample.

In general, fewer inorganics were detected above SQLs in SW1 during Phase II than were observed in Phase I. Inorganics above SQLs in BW1 were essentially the same in Phase II as in Phase I. By comparing the measured background concentrations of metals in groundwater with concentrations detected in downgradient wells, it is evident that the majority of inorganics detected in downgradient wells are at or below concentrations occurring in the background wells as illustrated on Tables 5.8 and 5.9. Exceptions observed during Phase I are silver and sodium concentrations in ground water from the saprolite aquifer and virtually all metals detected in ground water collected from bedrock well BW4. Exceptions noted based on the Phase II data additionally include aluminum, calcium, chromium, lead, manganese, magnesium, potassium, vanadium, and zinc in the saprolite wells.

Certain inorganics were also detected above MCLs in background wells BW1 and SW1 as well as SW3, SW4, and BW4. Arsenic and barium were detected above their respective primary MCLs in SW1. Iron and manganese were detected above secondary MCLs in BW1, SW1, SW3, and BW4. Iron and manganese observed above secondary MCLs in downgradient saprolite wells SW3 and SW4 occurred at concentrations less than those observed in SW1, upgradient of the site. Antimony, beryllium, and nickel exceeded proposed MCLs in well SW1, and beryllium exceeded the proposed MCL in well SW4.

Lead was detected above the Superfund cleanup level of 15 ug/l in wells SW1 and SW4, though at concentrations below the primary MCL. Except for cadmium in well BW2, where MCLs were exceeded in downgradient monitoring wells, MCLs were also exceeded in the upgradient background wells, indicating naturally-occurring concentrations of inorganics above MCLs.

The presence of sodium, iron, magnesium, aluminum, calcium, and manganese are not considered significant due to the characteristic natural abundance and variation in concentrations of these compounds in the local metamorphic rocks and saprolite which comprise the aquifer materials.

Analytical data for inorganics in public wells in the Cherokee County area were compiled for comparison with inorganic analytical results from the RI (Table 5.10). These data demonstrate that inorganic concentrations in ground water vary considerably in the vicinity of the Medley site. In general, inorganic concentrations reported for ground water at the site are within the ranges reported for the Cherokee County area.

Although cadmium was detected above the recently promulgated MCL of 5 µg/L in a single ground-water sample collected from well BW2 (10 µg/l), cadmium was also noted at concentrations above typical regional averages in the background soils analyses (SB1) and therefore, does not appear to be related to past disposal practices at this site.

5.8 SURFACE WATER

Four surface water samples were collected from Jones Creek and analyzed for VOCs and SVOCs (Appendix L-6). No VOCs or SVOCs were detected in any of the surface water samples above instrument detection limits (SQLs). Sampling locations are illustrated in Figure 3.2 (Section 3.4.2). Sampling location RW-2/SS-2 is downstream of the SW108/BW108 monitoring well location within the northern tributary to Jones Creek.

Sampling location RW-4/SS-4 is located in Jones Creek immediately downstream from the mouth of the southern tributary into Jones Creek. These sampling locations were situated to detect potential impacts to Jones Creek from the tributaries.

5.9 STREAM SEDIMENTS

Four stream sediment samples were collected and analyzed during Phase IB of the RI. Appendix L-7 presents the stream sediment analytical results. No VOCs or SVOCs were detected in stream sediment samples. Stream sediment sampling locations coincide with the surface water sampling locations and are also illustrated in Figure 3.2 (Section 3.4.2).

5.10 DATA VALIDATION AND FIELD QUALITY CONTROL

The frequency and type of QC samples collected and analyzed during the Medley Farm Site RI were in accordance with the EPA CLP and CERCLA. The field QC samples were collected as outlined in the POP and are summarized in Table 5.11.

TABLE 5.10
MEDLEY FARM SITE RI
INORGANICS ANALYTICAL DATA FOR PUBLIC WELLS IN THE CHEROKEE COUNTY AREA

SCDHEC Public Supply Wells: Cherokee County ¹ ppb		NURI Data: Cherokee & Union County Area ² ppb		SCWRC Blacksburg, S.C. Area ³ ppb	York County ⁴ ppb
		<u>Range</u>	<u>Average</u>	Range: Total/Dissolved	
Al		11-184	32.7	4,800-14,500/4,700-14,300	5,100-67,000
Ca	900-30,000			20-836/0-16	BDL-2,400
Fe	100-1,800			2,450-2,810/2,400-2,700	1,400-49,000
Mg	800-6,700	BDL-33,920	2,209	1-27/1-23	
Mn	50-120	BDL-239	24.9		2,400-16,000
Na		BDL-22,250	6,109	1,400-2,400/1,200-2,200	
Zn	100-9,000				

1. SCDHEC chemical and physical analysis of public drinking water supplies inventory for Cherokee County; 35 analysis from 20 ground water supplied public drinking water systems.
2. National Uranium Resource Inventory ground-water samples 1977; 15 wells in Cherokee and Union Counties in and about Kings Mountain belt and Charlotte Belt.
3. SC Water Resources Commission ground-water analysis in Blacksburg, S.C. Area, Kings Mountain belt, 3 domestic wells.
4. Published ground-water analysis in State Development Board Bulletin No. 33, 1966; 10 wells.

BDL - BELOW DETECTION LIMIT

Table 5.11
Medley Farm Site RI
Summary of Quality Control Samples

<u>Matrix</u>	<u>Analytical Fraction</u>	<u>Field Duplicate</u>	<u>Field Blank</u>	<u>Trip Blank</u>	<u>Sampler Rinsate</u>	<u>Field Samples</u>
Phase IA						
Ground Water	Volatile Organics	1	3	1	3	4
	Semi-volatile Organics	1	0	0	2	4
	Pesticides/PCBs	1	0	0	2	4
	Inorganics	1	0	0	3	4
Test Pits	Volatile Organics	1	0	2	1	10
	Semi-volatile Organics	1	0	0	0	8
	Pesticides/PCBs	1	0	0	0	9
	Inorganics	1	0	0	0	8
Phase IB						
Ground Water	Volatile Organics	1	1	2	1	7
Test Pits	Volatile Organics	1	1	2	1	6
	Semi-volatile Organics	1	0	0	1	6
Soil Borings	Volatile Organics	2	1	4	2	27
	Semi-volatile Organics	2	0	0	2	27

316
0244

Table 5.11
Medley Farm Site RI
Summary of Quality Control Samples
(Continued)

<u>Matrix</u>	<u>Analytical Fraction</u>	<u>Field Duplicate</u>	<u>Field Blank</u>	<u>Trip Blank</u>	<u>Sampler Rinsate</u>	<u>Field Samples</u>
Phase II						
Ground Water	Volatile Organics	2	2	11	1	27
	Inorganics	1	0	0	1	2
Surface Soil	Volatile Organics	1	1	2	1	12
Hand Auger	Semi-volatile Organics	2	0	0	0	13
Borings	Pesticides/PCBs	1	0	0	0	12
	Inorganics	0	0	0	0	7

Analytical results were reviewed in accordance with appropriate EPA data validation guidance (July 1, 1988, February 1, 1988). Surrogate recoveries were evaluated for compliance with QC limits. Relative percent differences were calculated for field duplicates and for field samples with analytes detected in the laboratory blanks. Holding times for extraction/digestion and analysis were reviewed for all samples to verify holding times were within QC limits. Each case narrative was reviewed in detail with Radian Laboratories (Appendix L). Data received on electronic file was carefully reviewed against the associated CLP report to ensure no errors occurred during exporting functions.

5.10.1 Field Quality Control Samples

Various types of samples were obtained during the Phase II investigation in order to provide quality control information for interpretation of data. This samples include field duplicates, rinsates, trip blanks, and field blanks. In all cases quality control samples are submitted to the laboratory as blind samples. Field quality control samples were collected and analyzed in accordance with EPA's document "Data Quality Objectives For Remedial Response Activities," (EPA 540/G-87/003), March 1987.

Field duplicates in this investigation were samples that had been divided into two portions at the sampling collection step. For soil samples, the sample was collected and placed into a common container for mixing before being split and placed into individuals containers. Each portion is then carried through the remaining steps in the measurement process. From this type of sample, precision information is gained on sample homogeneity, handling, shipping, storage, preparation, and analysis. Due to the difficulty in collecting totally homogenous soil samples, variability between the original and duplicate results for soil samples is expected to be higher than the variability observed in water samples.

Rinsates in this investigation were sample obtained by running analyte-free deionized water through the sample collection equipment (bailer, auger, etc.) after decontamination, and

placing the rinse water in the appropriate sample containers for analysis. Rinsate samples were used to determine the adequacy of decontamination procedures.

Trip blanks are prepared at the laboratory with analyte-free deionized water prior to the sampling event in the actual sample containers and are kept with the investigative samples throughout the sampling event. They are then packaged for shipment with the field samples and sent for analysis. At no time after their preparation are the sample containers opened before they reach the laboratory. The trip blank is used to indicate potential contamination due to migration of volatile organic chemicals from the air on the site or in sample shipping containers, through the septum or around the lid of the sampling vials, and into the sample. Results are viable only if the water comprising the blank was clean. For example, if the laboratory water comprising the trip blank was contaminated with volatile organic compounds prior to being taken to the field, then the source of volatile organic contamination in the trip blank cannot be isolated.

Field blanks in the investigation were defined as samples collected in the field by pouring analyte-free deionized water directly in the appropriate containers. These samples serve to measure potential contamination from the air, water being used to prepare samples, sample containers, preservatives, etc.

EPA collected split samples for analysis during the soil and ground water investigations. Split samples are replicate samples divided into two portions, sent to different laboratories, and subjected to the same environmental conditions and steps in the measurement process. They serve as an oversight function in assessing the analytical portion of the measurement system. EPA collected split samples on TP-1 in Phase IA, SS3, RW3, and BW3 in Phase IB, and SW109-3 and BW108 in Phase II. At the time of this report, split sample results from EPA had not been received.

Spike (EPA) samples were collected and analyzed during the ground water investigation. Spike samples are prepared in a laboratory by direction of EPA by injecting analyte-free deionized water with known amounts of a compound. These samples are then analyzed

by the laboratory performing the analyses for the field samples. The results of the spike samples serve as an indicator of accuracy.

5.10.1.1 Soil Investigation

A single field duplicate soil sample was collected and analyzed for volatile and semi-volatile organics. The comparison of the original sample (HA6) and the duplicate (HA6A) for the volatile compounds demonstrates high precision except for 1,2-Dichloroethene (total). This compound was not detected in the primary sample but was quantified at 200 ppb in the duplicate sample. This same sample pair was analyzed for semi-volatile organic compounds. High precision was demonstrated for all semi-volatile compounds. An additional field duplicate was analyzed for the semi-volatile analysis. The primary sample (HA16) and the duplicate sample (HA16A) did not reveal any positive hits (all results were below the detection limit). The primary sample (HA1-2) and the duplicate (HA1-2A) were collected and analyzed for pesticides/PCBs. Toxaphene was the only compound detected in both samples. The primary sample was quantified at 330 ppb whereas the duplicate was quantified at 530 ppb.

One rinsate sample (HA6D) was collected during the soil investigation and analyzed for volatile organic compounds. The sample was determined to be free of organics except for acetone at 45 ppb which is a common lab artifact according to the EPA. Refer to the Lab Quality Control section for more detail on managing lab artifacts.

Two trip blanks (TB1-C and TB2-C) were analyzed for volatile organic compounds during the soil investigation. No compounds were detected.

One field blanks (HA6B) was collected and analyzed for volatile organic compounds. No compounds were detected.

With respect to the field quality control samples, it is demonstrated that field and lab activities and performance associated with soil samples were in control.

5.10.1.2 Ground Water Investigation

Two duplicate samples were collected and analyzed for volatile organic compounds in the ground water investigation. No volatile organic compounds were detected in one primary (BW110-3) or the associated duplicate (BW110-3A) sample. Four compounds were detected in the second primary sample (SW101-3) and five compounds were detected in the duplicate sample (SW101-3A). Agreement between the second primary and duplicate sample demonstrates acceptable precision. The additional compound detected in the duplicate sample was quantified at a very low level that was less than the Contract Required Quantitation Limit. One duplicate sample was collected and analyzed for metals. Concentrations of metals detected were consistent between the primary (SW1-02) and the duplicate (SW1-02A).

A rinsate sample (SW4-3E) was collected and analyzed for volatile organic compounds during the ground water investigation. Methylene chloride was quantified at 3.3 ppb which is below the Contract Required Quantitation Limit. This compound is identified as a common laboratory artifact by EPA. Refer to the Data Validation section for more detail. A chlorinated hydrocarbon (1,1,1-Trichloroethane) was also detected at 10 ppb. One rinsate sample (SW-1-02D) was collected and analyzed for metals during the ground water investigation. No metals were detected above the Contract Required Detection Limit.

Eleven trip blanks were shipped and analyzed for volatile organic compounds during the ground water investigation. A summary of the detects for these samples follows:

<u>Sample</u>	<u>Compound</u>	<u>Concentration (ppb)</u>	<u>Flag</u>
SW101-1C	Carbon Disulfide	5.3	B@
	Methylene Chloride	2.5	BJ
SW103-1C	No Detects		

<u>Sample</u>	<u>Compound</u>	<u>Concentration (ppb)</u>	<u>Flag</u>
BW3-3C	1,1,1-Trichloroethane	3	J
	2-Butanone	21	
	Acetone	27	
	Carbon Disulfide	11	B
	Chloromethane	4	J
	Methylene Chloride	64	
BW105-1YC	Methylene Chloride	45	
	Toluene	3	
BW105-3C	1,1,1-Trichloroethane	26	
	1,1,2-Trichloroethane	3	
	1,1-Dichloroethene	5	
	Benzene	13	
	Carbon Disulfide	5	
	Chlorobenzene	56	
	Tetrachloroethene	6	
	Toluene	18	
BW106-1C	Carbon Disulfide	12	B
	Methylene Chloride	120	
	Vinyl Acetate	9	J
BW108-3C	No Detects		
BW110-3C	No Detects		
SW-1-02C	Methylene Chloride	34	B
	Toluene	180	
SW3-3C	Methylene Chloride	5.5	B
SW104-3C	1,1,1-Trichloroethane	2.1	J
	2-Butanone	51	B
	Carbon Disulfide	3	J
	Methylene Chloride	30	B

Note that some compounds detected in the trip blank were not detected in the corresponding field samples. Also, concentrations of compounds detected in both the trip blank and the corresponding field samples were higher in some of the trip blanks.

Two field blanks (BW110-3B and SW3-3B) were collected and analyzed for volatile organic compounds during the ground water investigation. No compounds were detected in BW110-3B. Methylene chloride was detected in SW3-3B at 4 ppb, below the Contract Required Quantitation Limit. This compound has been identified by EPA as a common laboratory artifact. Refer to the Data Validation section for more detail on laboratory artifacts. With respect to the field blanks, field procedures were in control.

In summary, with the exception of the trip blanks, the field quality control samples for the ground water investigation demonstrate that the field procedures were in control. The results from the trip blank analyses, however, are not consistent with respect to compounds quantified in the primary field samples.

5.10.2 Data Validation

Validation of analytical data consists of a number of steps and procedures. Data validation evaluation for the Medley Farm data was performed in accordance with EPA's document "Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) - Interim Final," (EPA/540/1-89/002), December 1989. The following steps were performed to evaluate the Phase II analytical data.

- (1) evaluate the analytical methods used;
- (2) evaluate the quality of data with respect to qualifiers and codes;
- (3) evaluate the quality of data with respect to blanks;
- (4) compare data to previously acquired data for consistency; and
- (5) compare potential site-related contamination with background.

Comprehensive analytical data tables were grouped according to the types of analyses conducted (e.g., EPA's SW-846 methods, EPA's Superfund Contract Laboratory [CLP] procedures) and are presented in the appendices. The outcome of this step is a set of site data that has been developed according to a standard set of sensitive, chemical-specific methods with QA/QC procedures that are well documented and traceable. The data resulting from analyses conducted under CLP comprises the majority of the results which fall into this category. Although the CLP was developed to ensure that consistent QA/QC methods are used, it does not ensure that the results are consistently of sufficient quality and reliability for quantitative assessment. The face value of these analytical results cannot be accepted until the evaluation steps listed above have been carried out.

For CLP analytical results, various qualifiers are attached to certain data by the laboratory conducting the analyses or the person performing the laboratory validation. These qualifiers often pertain to QA/QC problems and generally indicate questions concerning chemical identity, chemical concentration, or both. In general, because the data validation performed by the laboratory is intended to assess the effect of QC issues on data usability, validation data qualifiers are attached to the data after the laboratory qualifiers and supersede the laboratory qualifiers. Refer to the appendices for a list of qualifiers used in the report.

Laboratory blank samples provide a measure of contamination that has been introduced into a sample in the laboratory during sample preparation or analysis. To prevent the inclusion of non-site-related contaminants, the concentrations of chemicals detected in blanks must be compared with concentration of the sample chemicals detected in site samples. Blank data was compared with results from samples with which the blanks were associated. As discussed in the CLP SOW for Organics (EPA 1988) and the Functional Guidelines for Organics (EPA 1988), acetone, 2-butanone, methylene chloride, toluene, and the phthalate esters are considered by EPA to be common laboratory contaminants. In accordance with the Functional Guidelines for Organics (EPA 1988), if the blank contains detectable levels of common laboratory contaminants, then the sample results were considered as positive results only if the concentrations in the sample exceeded ten times the maximum amount detected in any blank. As discussed in the previous referenced

guidance, if the blank contains detectable levels of one or more organic chemicals that are not considered by EPA to be common laboratory contaminants, the site sample results were considered as positive hits only if the concentration of the chemical in the site sample exceeded five times the maximum amount detected in any blank.

Upon arrival of analytical data, an important step in the evaluation of the data is a comparison with previously acquired data for accuracy and consistency. An inconsistency was observed between the new raw data (Phase II data) and the previous results in four ground water wells shown to be free of contaminants in previous sampling in the RI. These ground water well locations are SW1, BW1, BW4, and SW106. The Phase II results consisted of positive hits above the Contract Required Quantitation Limit for several halogenated hydrocarbons and aromatic volatile compounds. Because of this inconsistency, resampling of these wells was performed immediately for volatile organic analysis by a different laboratory using the same analytical procedures. The analytical results from the resampling confirmed the previous Phase I results and did not include detects for volatile compounds except for the common laboratory contaminants identified by EPA. The Case Narratives have been included in the Appendices for more detailed information concerning laboratory problems and difficulties.

The Case Narratives summarize quality control sample results along with difficulties and problems encountered during calibration of the instrument and throughout the analyses. Case narratives typically include results from calibration data, surrogate recoveries, matrix spike/matrix spike duplicates, serial dilutions, and method blanks.

6.0 NATURE AND EXTENT OF CONTAMINATION

This section presents a general overview of the nature and extent of contaminants identified during the RI effort at the Medley Farm site in the soil, ground water, and surface water/sediment media. The overall significance of the analytical results for each of the media sampled are discussed.

This study indicates that contaminants present at the Medley Farm site consist of VOCs, SVOCs, and PCBs in surface soils and residual source materials; VOCs and SVOCs in subsurface soils beneath the former disposal area; and VOCs in ground water. No contaminants were detected above CLP Contract Required Quantitation Limits (CRQLs) in surface water or sediment samples. Concentrations of inorganic compounds detected in all media were consistent with naturally occurring levels found in the vicinity of the site (as demonstrated by the analyses of background samples of surface soils, subsurface soils, and ground water) and with common ranges reported for natural soils.

PCBs were only detected at low levels in surface soils, and composite samples of residual wastes and soils collected from test pits. Concentrations of PCBs detected in these media are well below the TSCA PCB Cleanup Policy level of 10 ppm. No PCBs were detected in any ground water sample.

Residual source materials remaining at the site are restricted to very small, limited areas and found only at former lagoon sites. When found, such materials consist of thin, isolated pockets of sludges and debris.

Contaminants present in the soils are representative of limited areas of direct, mostly shallow disposal. Soil borings and test pits were strategically sited during the RI to investigate suspected lagoon and drum disposal areas. The primary contaminants observed in soils at the site are VOCs. The most significant occurrences of VOCs correlate well with suspected former lagoon locations and areas where heavy concentrations of drums were stored. Based on test pit observations, analytical results, and information from aerial

photographs, approximate limits of the former site disposal area have been delineated on Figure 6.1.

6.1 Residual Source Materials

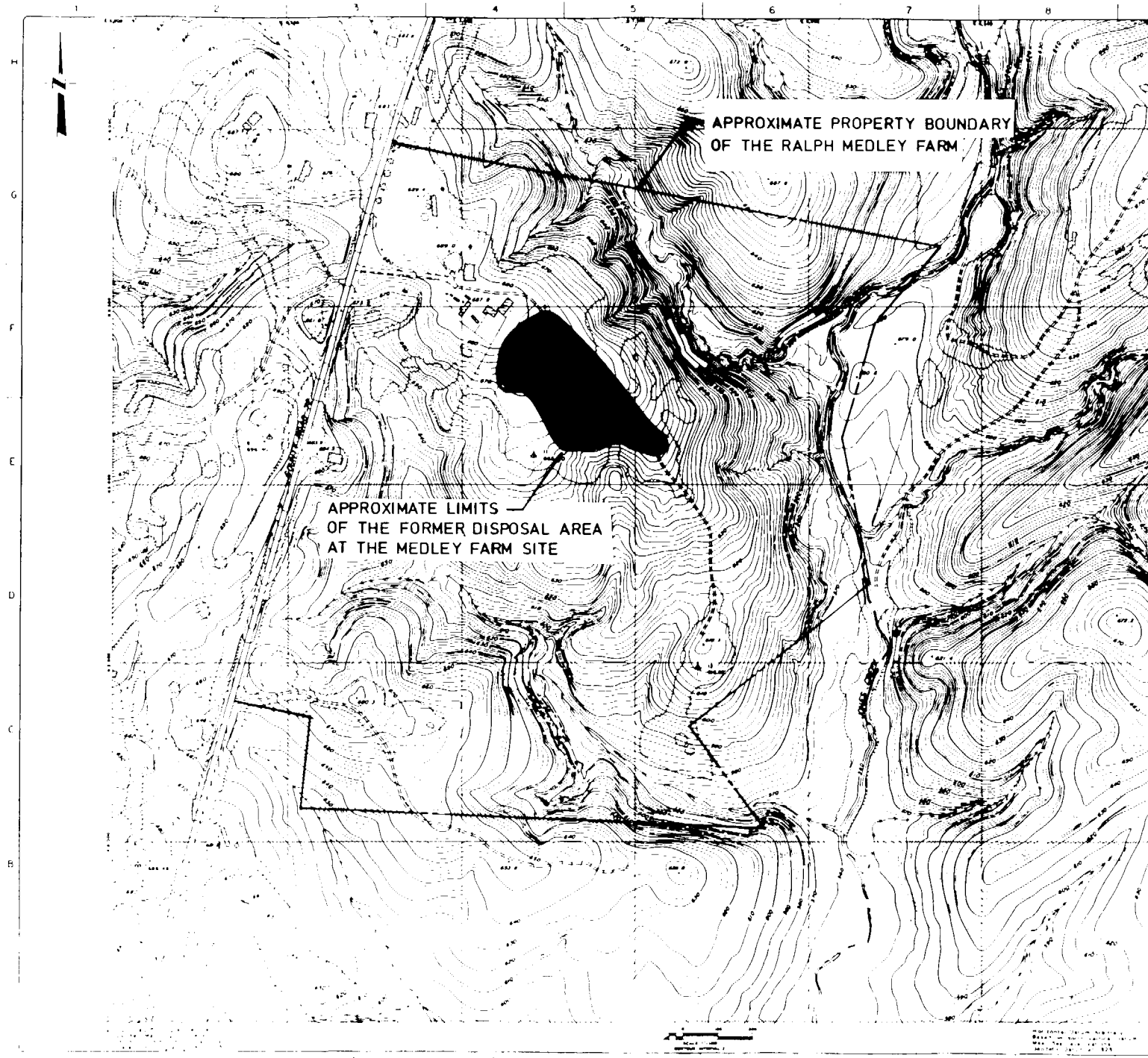
Evidence of former lagoons were observed while excavating test pits TP3, TP4, TP5, TP7, TP12, and TP14. This evidence consisted of thin, isolated pockets of sludge overlying matted vegetation and other residual waste materials. This material was typically encountered at depths of one-half to two feet below ground surface. No other residual waste materials were encountered in the extensive trenches excavated for source characterization except for occasional pieces of scattered debris such as plastic sheeting and rusted drum fragments. Detailed tables summarizing materials encountered in all test pits are included in sections 3.3.2 and 3.3.3. Review of analytical data summaries (Tables 5.3 and 5.4) reveal that elevated occurrences of VOCs correspond to these locations. Low concentrations of SVOCs were also observed in TP3, TP4, TP5, and TP7, again corresponding to the former lagoon locations.

Low concentrations of pesticides were observed in several samples collected from the test pits. Pesticides detected in samples from TP5 and TP10 are indicative of the presence of pesticides within limited portions of the source area. PCBs were also detected in test pit source characterization samples at concentrations below the TSCA action level of 10 ppm. Concentrations of inorganics detected in test pit source characterization samples are within published ranges of concentrations commonly occurring in natural soils.

6.2 Surface Soils

PCBs were detected in several surface soil samples. These samples, with one exception, are considered to be essentially within the limits of former disposal or drum storage areas of the site. HA-11, the exception, was collected from an area which receives sediment

3 10 0256



10 11

HORIZONTAL CONTROL POINT
VERTICAL CONTROL POINT
INDEX CONTOUR
INTERMEDIATE CONTOUR
DEPRESSION CONTOUR
SPOT ELEVATION
PILE
WATER
APPROVED ROAD
DIRT ROAD
BUILDING
LOCATED OBJECT
FENCE
POLE
TREE
BRUSH

Scale: 1" = 100'

Medley Farm Site
Geology, Soils, and
Remedial Investigation
Feasibility Study

FIGURE 1.1
APPROXIMATE LIMITS OF
THE FORMER DISPOSAL
AREA

runoff from the site via erosion, but is considered to be outside the limits of the former disposal area.

One pesticide was detected in one of the 15 surface soils samples at a trace level (Toxaphene - 330 ug/kg), indicating limited presence of pesticides in surface soils at the site.

6.3 Subsurface Soils

No vertical patterns of chemical distribution in soils are apparent. Elevated contaminant concentrations were generally found in samples collected from depths of less than 17 feet. Elevated levels of VOCs, however, were noted at depths as great as 27 feet in SB2, SB4, and SB9. Low concentrations of SVOCs were observed in SB2, SB3, and SB9.

In summary, there appears to be no uniform vertical or horizontal distribution of the residual chemicals present in the soils at the site. Instead, chemical residuals are concentrated in localized areas related to former direct disposal activities (lagoons and/or drum disposal areas). It appears that, due to the lack of steep topography in the immediate disposal areas, the heavy vegetative cover and the nature of chemical residuals at the site, overland migration of residual chemicals away from the former disposal area is not significant at this site. The immediate emergency removal action taken by EPA (June 20, 1983) has successfully removed a major portion of the source material and highly contaminated soils.

6.4 Ground Water

Elevated concentrations of VOCs were noted in wells SW3, SW4, BW2, SW108, and BW108. Trace levels of VOCs were detected in SW101, BW106, and BW109. SVOCs, pesticides, and PCBs were not detected in ground water.

The horizontal extent of ground-water contamination appears to be limited to portions of the aquifer directly beneath and immediately downgradient of the former disposal area. VOCs in ground water are estimated to have traveled 500 to 600 feet in an east-southeasterly direction from the main disposal area of the site, in the direction of ground water flow. Concentrations observed at this distance are detectable, but below established regulatory limits. The highest VOC concentrations detected in the saprolite were found in ground water immediately beneath the former disposal area with concentrations observed to decrease with distance from the disposal area (Figures 6.2 and 6.3).

Vertically, VOCs occur in both the saprolite and the bedrock. Within the limits of the former disposal area, ground water contamination extends from a depth of approximately 60 feet to a depth of approximately 120 feet from land surface. Two deep wells (BW111 and BW112) installed at the site encountered competent bedrock beginning at depths of approximately 160-170 feet beneath the site.

The presence of VOCs in both aquifer materials is consistent with the interrelated nature of the two water-bearing units. VOC concentrations decrease sharply with depth as illustrated on Figures 6.2, 6.3, and 6.4. Based on the observed distribution of VOCs, the primary path of contaminant migration in ground water would be through the saprolite and the bedrock transition zone.

6.5 Stream Sediment/Surface Water

No residual chemicals were detected in either the stream water samples, the sediment samples, or the monitoring wells closest to Jones Creek.

LEGEND

LITHOLOGIC CONTACT

VERY SEVERE TO SEVERELY WEATHERED ROCK
STIFF TO VERY STIFF (CAN TO FOLLOW) GRAY
TO REDDISH BROWN CLAYEY SILT TO SILT WITH
THIN QUARTZ VENEERS AND REEFY FOLIATION

VERY SEVERE TO MODERATELY WEATHERED ROCK
INCLUDES ROUND ROCK FRAGMENTS IN A SAPROLITE MATRIX
BLIGHT TO VERY BLIGHTLY WEATHERED UNLESS AND WHEN
WITH VERY CLOSE TO CLOSELY SPACED IRREGULAR
FRACTURES AND JOINTS (LESS THAN 2 FEET)
FRACTURE SPACING

VERY BLIGHTLY WEATHERED TO FRESH GNEISS AND SCHIST
WITH MODERATELY CLOSE TO WIDELY SPACED FRACTURES
AND JOINTS (1 FOOT TO 10 FEET FRACTURE SPACING)

BORING NUMBER
GROUND SURFACE ELEVATION IN G.D.

SAPROLITE MONITORING WELL SCREEN

BEDROCK OPEN COREHOLE

POTENTIOMETRIC SURFACE IN SAPROLITE
10-28-30 BW

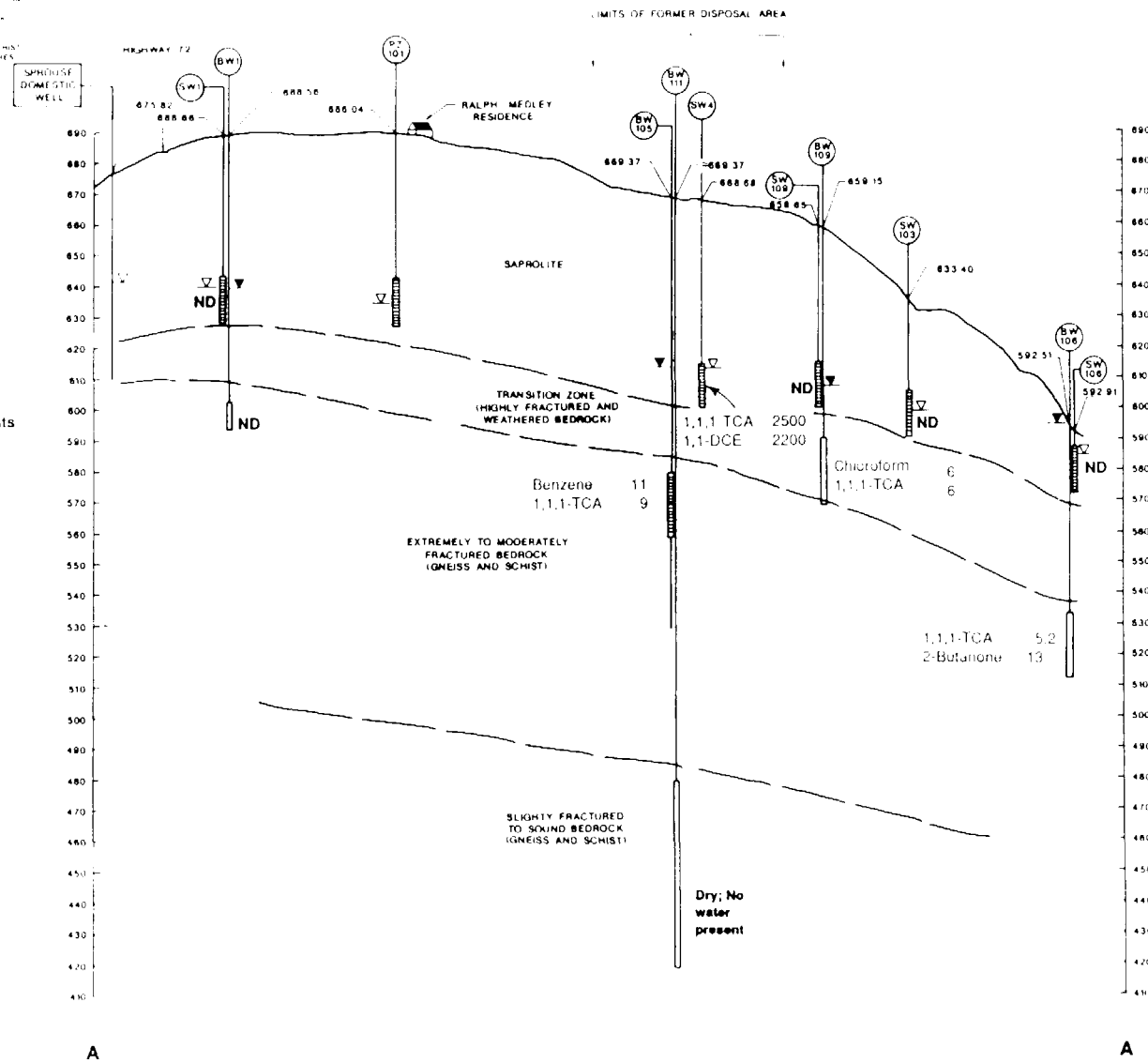
POTENTIOMETRIC SURFACE IN BEDROCK
10-28-30 BW

Concentrations reported in µg/L
for compounds detected above
Contract Required Quantitation Limits
(CRQLs).

ND Not detected above CRQLs.

Sample IDs for
Phase II Results Presented

Well	Sample ID
SW1	SW1-4
BW1	BW1-4
BW2	BW2-3
SW3	SW3-3
SW4	SW4-3
BW4	BW4-4
SW101	SW101-3
SW102	SW102-3
SW103	SW103-3
SW104	SW104-3
BW105	BW105-3
SW106	SW106-4
BW106	BW106-1
SW108	SW108-3
BW108	BW108-3
SW109	SW109-3
BW109	BW109-3
BW110	BW110-3



1. Lines representing the location of the site are based upon information from the site's location.
2. Refer to the site's location map for specific site descriptions.
3. Elevations refer to the National Geodetic Survey datum NAD 83. Elevations are based on the datum of the site's location map.
4. A screen was installed in the upper portion of the bedrock well BW105 and BW110.



Medley Farm Site
Remedial Investigation
Feasibility Study

FIGURE 6.2
CONCENTRATIONS
OF VOCs
CROSS SECTION
A - A

LEGEND

LITHOLOGIC CONTACT

VERY SEVERE TO SEVERELY WEATHERED (R.P.)
STONY TO VERY STONY TAY TO YELLOWISH GRAY
TO REDDISH BROWN CLAYEY BUT TO BAY WITH
THIN QUARTZ VENEES AND SELECT POLATION

VERY SEVERE TO MODERATELY WEATHERED (R.P.)
INCLUDES SOUND ROCK FRAGMENTS IN A SAPROLITE MATRIX

SLIGHT TO VERY SLIGHTLY WEATHERED (GNEISS AND SCHIST)
WITH VERY CLOSE TO CLOSELY SPACED (WIDELY SPACED)
FRACTURES AND JOINTS (LESS THAN 2 INCHES TO 1 FOOT)
FRACTURE SPACING

VERY SLIGHTLY WEATHERED TO FRESH (GNEISS AND SCHIST)
WITH MODERATELY CLOSE TO WIDELY SPACED FRACTURES
AND JOINTS (1 FOOT TO 10 FEET FRACTURE SPACING)

BORING NUMBER

GROUND SURFACE ELEVATION (IN FEET)

SAPROLITE MONITORING WELL SCREEN

BEDROCK OPEN COREHOLE

POTENTIOMETRIC SURFACE IN SAPROLITE

(IN 29.30' BOW)

POTENTIOMETRIC SURFACE IN BEDROCK

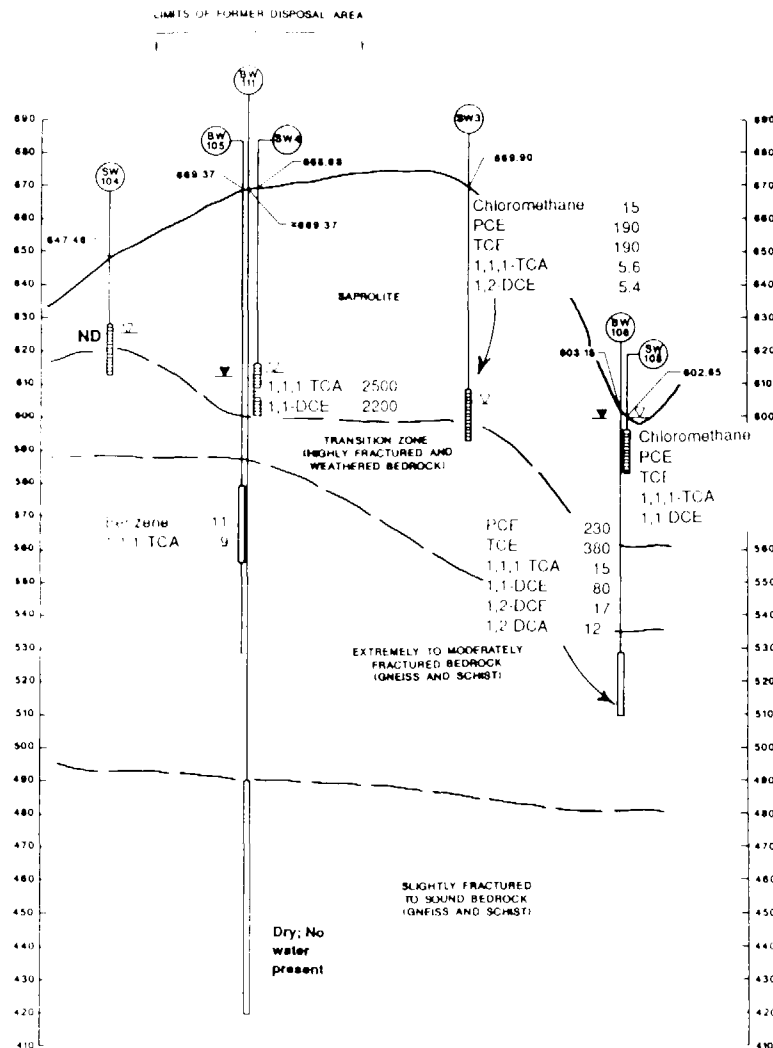
(IN 29.30' BOW)

Concentrations reported in µg/L
for compounds detected above
Contract Required Quantitation Limits
(CRQLs).

ND Not detected above CRQLs.

Sample IDs for
Phase II Results Presented

Well	Sample ID
SW1	SW1-4
BW1	BW1-4
BW2	BW2-3
SW3	SW3-3
SW4	SW4-3
BW4	BW4-4
SW101	SW101-3
SW102	SW102-3
SW103	SW103-3
SW104	SW104-3
BW105	BW105-3
SW106	SW106-4
BW106	BW106-1
SW108	SW108-3
BW108	BW108-3
SW109	SW109-3
BW109	BW109-3
BW110	BW110-3



0 100 200 300
SCALE IN FEET

NOTE:

1. Lines representing changes in strata are based upon interpolation between subsurface exploration locations.

2. Refer to logs of subsurface explorations included in Appendix D for specific soil and rock descriptions.

3. Elevations refer to the National Geodetic Vertical Datum (N.G.V.D.) formerly referred to as U.S.C. & G.S. Mean Sea Level of 1929.

4. A screen was installed in the open borehole of bedrock well BW105 and BW2.

DATE	DESCRIPTION
10/1/00	Initial Investigation
10/1/00	Phase II Investigation
10/1/00	Phase III Investigation
10/1/00	Phase IV Investigation
10/1/00	Phase V Investigation
10/1/00	Phase VI Investigation
10/1/00	Phase VII Investigation
10/1/00	Phase VIII Investigation
10/1/00	Phase IX Investigation
10/1/00	Phase X Investigation

SIRRIE
ENVIRONMENTAL
CONSULTANTS

Greenwich, South Carolina

Medley Farm Site
Greenville, South Carolina

Remedial Investigation
Feasibility Study

FIGURE 6.3
CONCENTRATIONS
OF VOCs
CROSS SECTION
B - B'

LEGEND

LITHOLOGIC CONTACT

VERY BEVENE TO BEVENE WEATHERED ROCK
STIFF TO VERY STIFF TAN TO YELLOWISH GRAY
TO REDDISH BROWN CLAYEY SILT TO SILT WITH
THIN QUARTZ VESSE AND MELT POLATION

VERY BEVENE TO MODERATELY WEATHERED ROCK
INCLUDES SOUND ROCK FRAGMENTS IN A SAPROLITE MATRIX
BLUNT TO VERY BLUNTLY WEATHERED UNDESS AND SILT
WITH VERY CLOSE TO CLOSELY SPACED IRREGULAR
FRACTURES AND JOINTS (LESS THAN 2 INCHES TO 1 FOOT
FRACTURE SPACING)

VERY BLUNTLY WEATHERED TO FRESH UNDESS AND SILT
WITH MODERATELY CLOSE TO WIDELY SPACED FRACTURES
AND JOINTS (1 FOOT TO 10 FEET FRACTURE SPACING)

BORING NUMBER

GROUND SURFACE ELEVATION IN G.V.D.

SAPROLITE MONITORING WELL SCREEN

BEDROCK OPEN CONCENTRATOR

POTENTIOMETRIC SURFACE IN SAPROLITE
(10-20-30-40)

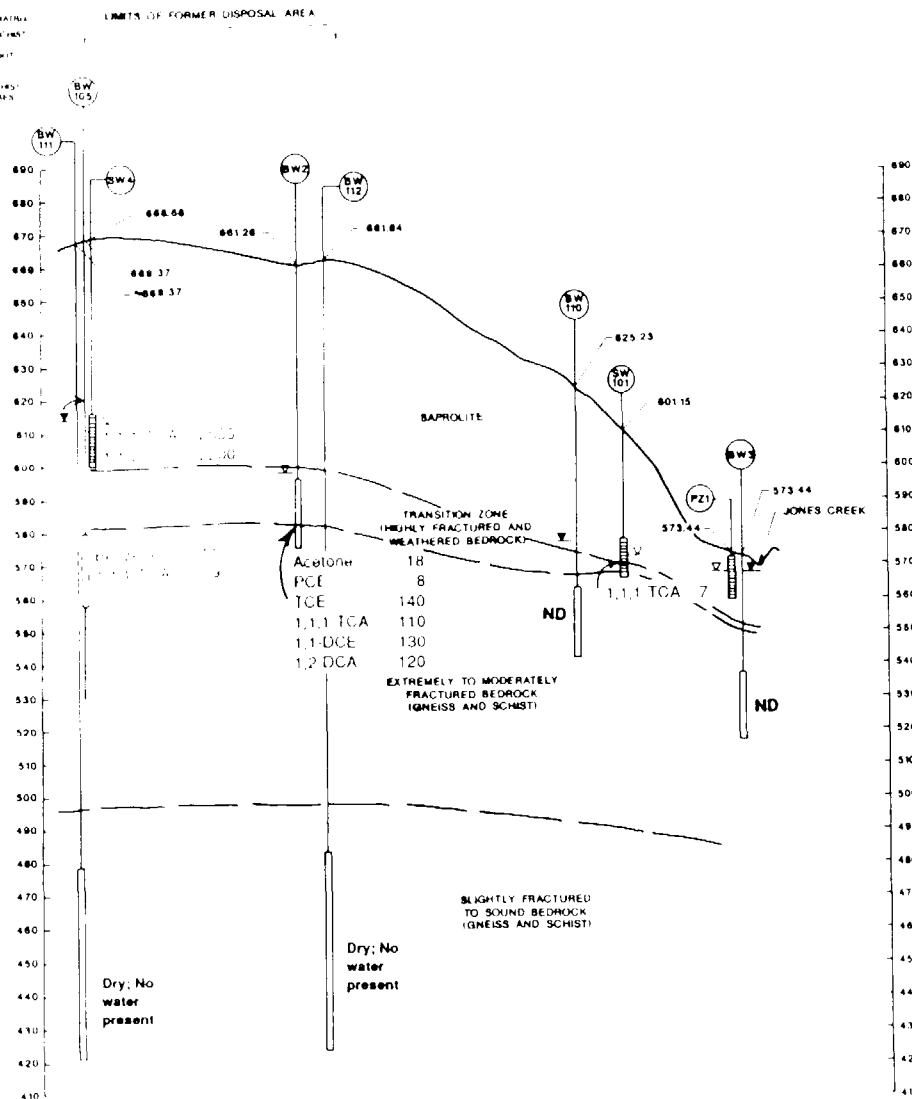
POTENTIOMETRIC SURFACE IN BEDROCK
(10-20-30-40)

Concentrations reported in $\mu\text{g/L}$
for compounds detected above
Contract Required Quantitation Limits
(CRQLs).

ND Not detected above CRQLs.

Sample IDs for Phase II Results Presented

Well	Sample ID
SW1	SW1-4
BW1	BW1-4
BW2	BW2-3
SW3	SW3-3
SW4	SW4-3
BW4	BW4-4
SW101	SW101-3
SW102	SW102-3
SW103	SW103-3
SW104	SW104-3
BW105	BW105-3
SW106	SW106-4
BW106	BW106-1
SW108	SW108-3
BW108	BW108-3
SW109	SW109-3
BW109	BW109-3
BW110	BW110-3



NOTES

1. Lines representing changes in strata are based upon interpretation between subsurface exploration locations.
2. Refer to logs of subsurface explorations included in Appendix D for specific soil and rock descriptions.
3. Elevations refer to the National Geodetic Vertical Datum (N.G.V.D.) formerly referred to as U.S.C. & G.S. Mean Sea Level of 1929.
4. A screen was installed in the upper portions of bedrock wells BW105 and BW110.

REV.	NO.	DATE	DESCRIPTION
1	1	01/01/01	INITIAL DESIGN AND CONSTRUCTION
2	2	01/01/01	REVISIONS TO DESIGN AND CONSTRUCTION
3	3	01/01/01	REVISIONS TO DESIGN AND CONSTRUCTION
4	4	01/01/01	REVISIONS TO DESIGN AND CONSTRUCTION
5	5	01/01/01	REVISIONS TO DESIGN AND CONSTRUCTION

SIGNATURE

DATE

PROJECT

LOCATION

DATE

SIRRIE
ENVIRONMENTAL
CONSULTANTS

Greenville, South Carolina

Medley Farm Site
Greenville, South Carolina

Remedial Investigation
Feasibility Study

FIGURE 6.4
CONCENTRATIONS
OF VOCs
CROSS SECTION
C - C

7.0 SUMMARY AND CONCLUSIONS

1. Contaminants are present at the site in soils in the immediate vicinity of the disposal area and in ground water in the saprolite and bedrock beneath and downgradient of the former disposal area.
2. Contaminants present in soils are related to distinct, localized, primarily shallow source areas of direct disposal (lagoons or drum disposal areas).
3. The small amount of residual source materials found consist of thin, isolated pockets of sludges and debris located at former lagoon sites. This material was typically encountered at depths of one-half to two feet below ground surface.
4. Contaminants detected in soils consist of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) pesticides and PCBs. PCBs were only detected at low levels in test pit source characterization samples and surface soil samples. PCBs were not found above TSCA action levels. Pesticides were only detected at trace levels at three locations; two samples collected from test pits and one surface soil sample.
5. Concentrations of inorganic constituents detected in soil samples collected from the site are consistent with concentrations detected in soil samples from local background locations and with common ranges reported for natural soils. No elevated levels of inorganic constituents were observed in source characterization analyses.
6. The only contaminants detected in ground water at the site consist of VOCs. VOCs were detected in ground-water samples collected from saprolite and bedrock wells, with the highest concentrations occurring immediately beneath the source area.
7. Water level measurements in the Sprouse domestic well, the background wells (SW1 and BW1), and the piezometer located NW of the source area indicate that the Sprouse well and the two background wells are hydraulically upgradient of the Medley Farm site and have therefore not been impacted by former disposal activities.
8. No contaminants were detected in ground-water samples collected from the two background wells (saprolite and bedrock) located between the Site and the Sprouse well.
9. Concentrations of inorganics detected in ground water are consistent with local background levels. Where MCLs for inorganics were exceeded in downgradient monitoring wells, MCLs for inorganics were also exceeded in the upgradient background wells, indicating naturally-occurring concentrations of inorganics above

MCLs. Inorganics detected above MCLs in monitoring wells at the site are not related to former disposal activities at the Medley Farm Site.

10. The ground-water yield from wells installed in the upper portion of the bedrock are significantly higher than from wells installed in the saprolite. The dominant direction of ground water flow is to the southeast. Vertical gradients at the site are generally upward and of varying magnitude.
11. Contaminants detected in ground water have not reached the closest perennial discharge area (Jones Creek, located to the southeast and east of the site). No contaminants were detected in analyses of surface water and stream sediments collected from Jones Creek. VOCs were not detected in monitoring wells installed immediately west of Jones Creek.

8.0 REFERENCES

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